

TROPICAL DISEASES BULLETIN

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MAIN CONTENTS

PAGES		PAGES	
Summary of Recent Abstracts.		Leprosy	592-601
V. Leishmaniasis ...	521-525	Helminthiasis	601-626
Malaria ...	525-542	Deficiency Diseases ...	626-627
Trypanosomiasis ...	542-553	Sprue	627-628
Leishmaniasis ...	553-561	Haematology	628-632
Fever of the Typhus Group ...	561-565	Venoms and Antivenenes ...	632-633
Bartonellosis ...	565-566	Toxoplasmosis	634-637
Yellow Fever ...	566-568	Dermatology and Fungus Disease	637-640
Dengue and Allied Fevers ...	568	Tropical Ophthalmology ...	640-641
Rabies ...	568-579	Miscellaneous Diseases ...	642
Plague ...	579-580	Parasitology: General ...	642-647
Cholera ...	580-582	Entomology and Insecticides: General	647-655
Amoebiasis and Intestinal Protozoal Infections ...	582-590	Reports and Surveys ...	656-661
Relapsing Fever and Other Spirochaetoses ...	590-592	Book Reviews ...	661-664

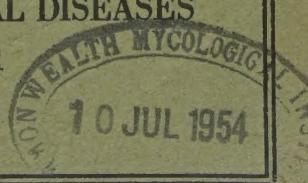
For detailed Contents see pp. ii, iv, vi, viii, ix, x, xi, xii, xiii and xiv.

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BUREAU OF HYGIENE AND TROPICAL DISEASES

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SUMMARY OF RECENT ABSTRACTS *

V. LEISHMANIASIS †

VISCERAL LEISHMANIASIS

General : Epidemiology

In a discussion of immunity in leishmaniasis BENETAZZO and CICCHINI (p. 21) make the point that the identity of the different species of the genus *Leishmania* is still to be established, though the terms *L. donovani*, *L. tropica* and *L. brasiliensis* are still used. Immunization by vaccination has given considerable results in cutaneous leishmaniasis.

A case of kala azar has been reported (the first of its kind) in the district of Forli, Italy, by FUSAROLI (p. 802). LEONARDI and CONSOLI (p. 499) make the point that in Sicily there was a marked increase in visceral leishmaniasis during and after the war, when the standard of hygiene was low. They describe an unusual mode of onset of the disease in an adult.

From Abadan REID (p. 21) reports the first indigenous case of kala azar to be recorded in South Persia, and shows that although cutaneous leishmaniasis is common in South-west Asia, the visceral form is rare except in Transcaucasia.

Kala azar has long been known to exist in northern Kenya, but since 1939 the number of cases reported has been increasing. FENDALL (p. 496) now reports a new focus further south, and such evidence as there is indicates that it was probably introduced during the war by returning soldiers. *Phlebotomus congolensis* and *P. africanus* abound. Response to treatment appears to be rather more favourable than in the Sudanese type of kala azar; urea stibamine and pentamidine were used.

An outbreak of kala azar in a leprosy institution in Bombay city is described by PURANDARE *et al.* (p. 497); accounts of this and other foci in the province have been given in the last few years. Kala azar has not previously been reported in Kashmir, but JACOB and KALRA (p. 96) record a few cases in the army there. A survey disclosed many species of

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on leishmaniasis in this series see the June issues of the *Tropical Diseases Bulletin* each year since 1939.

Phlebotomus, but dissected flies were not found to be infected. In comment Napier suggests that as the climatic conditions of Kashmir are unsuitable for transmission, even though potential vectors exist, a small focus of infection may have developed in military quarters where conditions were more favourable. SEN GUPTA (p. 96) gives an account of kala azar in Assam. It is known that the incidence usually rises considerably after disasters such as earthquakes, famines and epidemics of other diseases, and the author has traced the effect of epidemics on the incidence rates. He shows that although mass treatment has shown success, the number of cases of resistance to antimony has lately increased. Control may perhaps depend in future on the insecticides.

Probably the first case of kala azar to be reported from Mexico is described by BÁEZ VILLASEÑOR *et al.* (p. 497).

Transmission : Aetiology

In examinations of female *P. perniciosus*, *P. longicuspis* and *P. sergenti* captured in kennels near Algiers, PARROT and DONATIEN (p. 98) found flagellate forms of *Leishmania* in 10·3-15·3 per cent., the highest rates occurring in May and August. In some flies the proventriculus appeared to be blocked. It seems that *P. longicuspis* is as able as *P. perniciosus* to transmit infection from dog to dog or from dog to man.

HEISCH and GUGGISBERG (p. 803) have published notes on the sandflies of Kenya, where they suspect that *Phlebotomus clydei* may be a vector of kala azar.

RODHAIN (p. 497) shows that two wild murid rodents from Central Africa are susceptible to infection with *L. donovani*.

YOUNG (p. 98) describes the process of phagocytosis of *L. donovani* after intraperitoneal inoculation in hamsters and guineapigs.

TRAGER (p. 802) has succeeded in cultivating *L. donovani* extracellularly in a medium containing extracts of human or rabbit erythrocytes and various salts, glucose and serum. The leishmaniae grew at 37°C., and produced forms intermediate between the intracellular leishmania forms and the leptomonad forms.

Tests : Pathology : Treatment : Control

An extensive investigation of the complement-fixation test for kala azar, in which the antigen is prepared from an acid-fast organism (Kedrowsky bacillus), has been made by SEN GUPTA and ADHIKARI (p. 498). They find this test most valuable; it is more sensitive than other serum tests, and it gives false positive results only in conditions unlikely to be mistaken for kala azar. HENRY (p. 1030) discusses the flocculation tests for malaria and kala azar, claiming that the hydroseroflocculation test is not positive in kala azar.

SEN GUPTA and BHATTACHARJEE (p. 1030) describe the histopathology of post-kala-azar dermal leishmaniasis, of which they recognize 3 types, hypopigmented, erythematous and nodular. Parasites are found in all, but are least numerous in the first, and most numerous in the last. SEN GUPTA *et al.* (p. 97) treated 30 patients suffering from post-kala-azar dermal leishmaniasis with Glucantime, and cured 13; the treatment gave some improvement in 10 others but failed in 7. The number of injections varied from 12 to 53.

NASIR-UD-DIN (p. 97) quotes evidence which suggests that a campaign of residual spray with DDT failed to influence the incidence of kala azar (in an endemic area of East Bengal) in the first few months, but that it

had a material effect after a year or more. The findings were based on the results of the aldehyde test.

CUTANEOUS LEISHMANIASIS

In 1949-51 an outbreak of oriental sore occurred in the Province of Salerno, Italy, in which for the whole period the incidence was 85 per 1,000. ROMANO and IANNUZZI (p. 294) treated the patients with local infiltration of 10 per cent. mepacrine or gave general treatment with Glucantime. The results with each method of treatment were reasonably good.

A considerable paper on the sandflies of Iraq has been written by PRINGLE (p. 575) who quotes findings which suggest that *P. sergenti* is the vector of oriental sore there. PETRISHCHEVA and GUBAR, (p. 694) obtained circumstantial evidence of the breeding of several species of *Phlebotomus* in the burrows of *Rhombomys opimus* by finding larvae and pupae there, and PETRISHCHEVA *et al.* (p. 695) found them also in the nests of certain birds, but conclude that breeding there takes place only occasionally. The sandflies included *P. papatasi* and *P. sergenti*.

Various strains of *L. tropica* exist which have in Russia been correlated with different types ("wet" and "dry") of oriental sore, and with different sandfly vectors. In Israel ADLER and KATZENELLENBOGEN (p. 99) inoculated a large number of people with a strain of *L. tropica*, and observed that it did not produce a uniform clinical picture. They conclude therefore that this strain (or strains) behaves differently from the strains found in Central Asia.

DOSTROVSKY *et al.* (p. 803) show that in oriental sore the leishmanin test becomes positive soon after infection, and remains so for life, but that immunity does not develop as long as parasites persist in the lesions, though when once fully developed it also persists for life. They found that artificial superinfection of patients in the relapsing stage gave rise to lesions similar to the relapse lesions; these patients all had positive leishmanin tests, and the authors therefore conclude that since the immunity was insufficient to prevent superinfection, the two processes, allergy and immunity, are distinct.

FIDLER (p. 499) reports a case of oriental sore in which the incubation period was 3½ years and the duration of the lesion 20 months; spontaneous healing took place after traumatic injury.

In part of Italy where the incidence of active oriental sore was 2·9 per cent., and of scars 20·8 per cent., CORRADETTI (p. 22) shows that the use of residual DDT in houses and stables on two occasions (the summer months of 1948 and 1949) resulted in reduction of incidence of active lesions to 0·13 per cent., and in complete disappearance of the vectors from buildings in the treated area. A control area showed no such reductions.

AMERICAN LEISHMANIASIS

In a report on leishmaniasis in Bogotá, Colombia, LAVERDE (p. 294) makes the point that diagnosis was usually made on clinical grounds and by exclusion of yaws, syphilis, sporotrichosis and blastomycosis, since leishmaniae were rarely found in the mucous lesions. Treatment with Glucantime usually led to improvement, without serious side effects.

Muco-cutaneous leishmaniasis is common in Ecuador, and the infection is found in man, dog, cat, horse, agouti, opossum and other sylvatic rodents. CARRERA COBOS (p. 918) discusses the disease and describes a case. TORRES MUÑOZ (p. 1031) recounts the history of cutaneous leishmaniasis in collectors of chicle gum in Yucatán, and describes 21 cases.

BIAGI and BIAGI (p. 1132) have recorded species of *Phlebotomus* from an endemic area of leishmaniasis in Mexico.

GUIMARÃES (p. 695) has shown that when material from human lesions of muco-cutaneous leishmaniasis is inoculated intraperitoneally or subcutaneously into hamsters, they usually show visceral infections, but only rarely if leishmania cultures are injected. He (p. 695) found, however, one strain which gave nodular lesions in man and hamsters, without visceral involvement; this strain was infective for white mice, and produced slight visceral lesions.

In a study of the histopathology of cutaneous leishmaniasis in Panama THORNBURGH *et al.* (p. 99) found that the main features were epithelial hyperplasia, poor granulations, intense chronic inflammation of the dermal papillae, and localization of inflammatory cells about sweat glands towards the periphery of the lesions. For positive diagnosis, however, demonstration of parasites was necessary.

The Montenegro test is carried out by injecting intradermally a suspension of leptomonad forms of *L. brasiliensis*, and a positive allergic reaction is given in cutaneous leishmaniasis. ROTBERG (p. 203) has written a monograph in which he sums up earlier work on this test; he notes that there have been great differences in the antigens used by various workers, and he has therefore observed the results obtained in his own trials with various preparations of the leptomonads injected or applied as a patch test. He also used antigens of *Trypanosoma cruzi* and *Leishmania enriettii*. He suggests that a suspension containing 10^7 leptomonads (*L. brasiliensis*) per ml. should be the standard for the Montenegro test, the intradermal dose being 0.1 ml., and that results should be read 48 hours and 15 days after the infection. Patch tests with dried powdered leptomonads may be used in patients with certain leishmanial skin lesions ("leishmanids") or in hypersensitive persons. A preparation of powdered leptomonads, or glycerol suspensions of this preparation, may be applied to scarifications of the skin, and give reactions, and the author considers that such a test may be suitable for use in masses of people in remote endemic areas. In 36 of 84 persons living in part of Mexico where cutaneous leishmaniasis (chicle ulcer) is endemic, BIAGI (p. 1031) found the Montenegro test positive; in 14 of these there were no obvious lesions. This test is not affected by toxoplasmosis or tuberculosis.

PELLEGRINO (p. 696) has used a polysaccharide of *L. brasiliensis* for a skin test, with success in the 2 cases tested, and also an antigen from a suspension of culture forms. In 6 normal persons these tests were negative.

FLOCH and SUREAU (p. 1032) discuss *pian bois*, the muco-cutaneous leishmaniasis of South America, which occurs in French Guiana; visceral leishmaniasis is not known there. They think that 2 forms occur—*uta* in which mucosal lesions are rare, and *espundia* in which they are common and secondary. *Uta* occurs in the foothills and *espundia* in hot, humid forest areas at sea level. *Uta* differs from oriental sore in not producing complete immunity. There are probably 2 distinct strains of leishmania which give rise to these different forms.

JAFFÉ (p. 100) describes a case of American muco-cutaneous leishmaniasis which presented as a nasal polypus. Removal of the tumour, and treatment with Repodral, resulted in cure.

SILVA (p. 100) has successfully treated American cutaneous leishmaniasis with lomidine, and suggests this drug should be used in cases resistant to antimony or arsenic, or where these are contra-indicated. SNAPPER (p. 804) shows that treatment of a severe case with 2-hydroxystilbamidine was

remarkably successful. This compound does not give rise to the unpleasant side effects associated with stilbamidine itself.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control; Animal malaria—monkeys, other animals, birds.

ERRATUM

It is regretted that in the **Summary of Recent Abstracts, III Malaria**, this *Bulletin*, 1954, v. 51, 331, paragraph 2, line 10, the word "sexual" was used instead of the word "asexual"; the phrase should therefore read "it acts on the young asexual forms".

GILLET, J. Le paludisme au Congo belge et au Ruanda-Urundi. [**Malaria in the Belgian Congo and Ruanda-Urundi**] *Inst. Roy. Colonial Belge Bull. des Séances*. 1953, v. 24, No. 4, 1342-61. [27 refs.]

This paper has been drafted in connexion with a nosological map which is to be published in a general Atlas of the Belgian Congo. It describes the prevailing types of malaria, with a list of the 39 species and 12 varieties of Anophelines recorded in the Belgian Congo, and gives short notes on the principal ones.

Figures are given for morbidity and mortality, together with malariormetric indices. There is also a short note on the incidence of congenital malaria.

A brief description is given of the measures of control in use. Readers of this *Bulletin* will be familiar with the work described.

CHARDOME, M., PEEL, E. & LAMBRECHT, F. L. La malaria dans la vallée de la Ruzizi. [**Malaria in the Ruzizi Valley, Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1953, Oct. 31, v. 33, No. 5, 371-5.

This paper gives the results of the examination of the blood for malaria parasites of 1,031 inhabitants of the Ruzizi Valley, living at different altitudes. In some cases thick drop and smear preparations were made in the usual way but in most cases blood preparations were obtained by scarification of the skin in the scapular region.

In villages on the Costermanville-Usumbura road, 775 metres above Lake Tanganyika, 296 children were examined by scarification; parasites were found in 292. *P. falciparum* was found in 266, of whom 116 were gametocyte carriers. Corresponding figures for the other species were *P. malariae* 132 and 31; *P. vivax* 70 and 16. The spleen rate was 57 per cent.

In two villages on the same road at heights of 900-950 metres, 261 children were examined, by thick drop and smear preparations. Parasites were found in 142: *P. falciparum* 111 of whom 44 harboured gametocytes; *P. malariae* 39 with 6 gametocyte carriers; *P. vivax* 21 with 7. On the whole parasites were few in number. The spleen rate was 40.6.

In Lemera at a height of 1,500-1,580 metres 56 persons were examined. Of these 20 harboured *P. falciparum*, 9 with gametocytes, *P. malariae* 7 and 3. Only one had a mixed infection; he had gametocytes of both species. No *P. vivax* was seen. Seven persons harboured *P. falciparum* gametocytes alone. The spleen rate of 53 children was 17 per cent.

In 3 hamlets at an altitude of 2,000 to 2,030 metres infections were very rare and these had probably been contracted at lower altitudes. No splenic enlargements were seen. The scarification method was markedly more successful in revealing these rare infections than were thick drops and smears made in the usual way.

Norman White

CHARDOME, M., PEEL, E. & LAMBRECHT, F. L. La malaria dans le Mosso-Sud (Urundi). [**Malaria in South Mosso (Urundi)**] *Ann. Soc. Belge de Méd. Trop.* 1953, Oct. 31, v. 33, No. 5, 377-82.

This records the results of the examination of blood preparations from the inhabitants of three regions of South Mosso in Urundi. Parasites were found in 94.59 per cent. of 111 children examined and in 51.3 per cent. of 115 adults. Taken together *P. falciparum* was found in 89.63, *P. malariae* in 35.36 and *P. vivax* in 6.09 per cent. of films examined. Single infections were *P. falciparum* 43.81, *P. malariae* 6.19, and *P. vivax* 1.32 per cent. *Dipetalonema perstans* was found in 20 films.

Norman White

ALLISON, A. C. **Protection afforded by Sickle-Cell Trait against Subtertian Malarial Infection.** *Brit. Med. J.* 1954, Feb. 6, 290-94, 1 chart. [33 refs.]

BRITISH MED. J. 1954, Feb. 6, 320-21. **Sickling and Malaria.**

In order to explain the maintenance of populations with high sickle-cell trait rates, the author has assumed that under certain conditions persons possessing the trait have a selective advantage over those without it, and that this advantage might rest in a relative immunity to malaria. He then showed that the incidence of malaria was lower among African children of the Ganda tribe (living around Kampala in Uganda) in those exhibiting the sickle-cell trait (28 per cent.) than in non-sicklers (46 per cent.)—the difference being particularly noticeable with *Plasmodium falciparum* infections.

Next he investigated the course of *P. falciparum* malaria in 2 groups of African volunteers (belonging to the Luo tribe), 15 with and 15 without the sickle-cell trait. The infection was induced either by blood or by sporozoites, and 2 strains were used—Malayan and local. The results were most striking, in spite of a degree of premunition which was apparent throughout both groups and damped down all infections. Only 2 of the sicklers showed parasites and then in low density, while in 14 of the non-sicklers the infection became established, occasionally quite heavily. The author thinks therefore that persons possessing this abnormal form of haemoglobin are less suitable hosts for *P. falciparum*, and will in fact tend to survive, in contrast to those without it, who are likely to die in childhood. The incidence of the trait in East Africa is said to follow closely the degree of endemicity of malaria.

The mechanism operating in this phenomenon is obscure, but is obviously connected with the metabolism of haemoglobin by the parasite; sickle-cell haemoglobin is relatively insoluble when reduced and may not be usable by the parasite in this form. [The suggestion that species specificity of *Plasmodium* may be due to differences in haemoglobin appears to the reviewer most unlikely: the explanation is probably much more fundamental and begins long before the parasite enters the erythrocyte—the pre-erythrocytic tissue phase is primarily concerned, and this either fails to

develop or is abnormal when a parasite is introduced into the wrong host.] [See also this *Bulletin*, 1953, v. 50, 241; 1954, v. 51, 508.]

P. C. C. Garnham

DETINOVA, T. S. [The Duration of the Gonotrophic Cycle in the Mosquito *Anopheles maculipennis*; the Time Interval between Oviposition and the Blood Meal] *Med. Parosit. & Parasitic Dis.* Moscow, 1953, No. 5, 446-9, 2 figs. [In Russian.]

The author has found that, following oviposition in *Anopheles* mosquitoes, the remnant of the follicle wall, which previously enclosed each ovum and to which she refers as the terminal portion of each egg tube, is normally dilated and sac-like and remains so for a period of 24 hours. This makes possible the recognition of females that have recently laid eggs. During the next 24 hours shrinkage of this empty sac occurs and by 48 hours after oviposition only a trace of it remains. The taking of a blood meal was not found to influence the rate of shrinkage.

Applying this method of observation to unfed females (Sella's stage I) of *A. maculipennis* caught in Moscow Province and dissected the same day, she found that 65.8 per cent. of 78 specimens had laid eggs recently, 20 per cent. had "normal" egg tubes and were presumed to have laid eggs 48 hours previously and the remainder were at an intermediate stage. Of 1,245 wild caught, recently fed females (Sella's stage II), 52.3 per cent. had laid eggs recently, 31.5 per cent. had normal egg tubes and the remainder were at an intermediate stage. It is concluded that the majority of females feed the same night as, and shortly after, they have laid eggs, but that in about one-third an interval of at least 24 hours elapses at this stage of the gonotrophic cycle.

[Details of this technique have apparently been given by the author in an earlier uncited publication. The method presupposes that all the females recorded had laid eggs at least once before capture, but no mention is made of any separation of the material into nulliparous and multiparous groups before the condition of individual egg tubes was examined.] M. T. Gillies

RAGEAU, J., ADAM, J. P. & RIVOLA, E. Étude préliminaire sur la biologie d'*Anopheles gambiae*, Giles 1902 dans les régions forestières du Sud-Cameroun. [Preliminary Study of the Biology of *Anopheles gambiae* in the Forest Regions of the South Cameroons] *Ann. Parasit. Humaine et Comparée*. 1953, v. 28, Nos. 5/6, 425-49, 6 graphs & 4 figs. [41 refs.]

The authors point out that despite the great deal of work which has been done on the biology of *Anopheles gambiae* and *A. funestus*, there are still conflicting opinions about important points such as the extent to which *A. gambiae* feeds out of doors, and the proportion which feeds on man. As this knowledge is essential in interpreting antimalaria campaigns based on house spraying with residual insecticides in the South Cameroons, preliminary observations have been made and the results compared with existing knowledge of *gambiae* in Africa as a whole as summarized by DE MEILLON [this *Bulletin*, 1948, v. 45, 295], MUIRHEAD-THOMSON [*ibid.*, 1951, v. 48, 704], HOLSTEIN [*ibid.*, 1953, v. 50, 360], and others.

The climate and topography of the South Cameroons are described. A

detailed study of *A. gambiae* breeding places shows conditions very similar to those in other parts of West Africa.

With regard to adults, *A. gambiae* appears to be rare in houses of the forest villages such as Evodoula, where careful search of over 200 habitations yielded only a score of female *A. gambiae*. Search in outdoor haunts gave disappointing results, as also did the use of window exit traps in the houses. In contrast, at Yaoundé *A. gambiae* is relatively easy to find. [It is not perfectly clear whether a difference in behaviour is implied, or whether, as is likely, *A. gambiae* is naturally scarce in these forest regions.]

With regard to different opinions about the existence of 2 races of *A. gambiae*, an endophilic race feeding mainly on man, and an exophilic race mainly attracted to animals, the authors suggest that a simple explanation of these differences would be that *A. gambiae* prefers a certain well-defined environment for feeding or for resting, and that in some areas this environment is provided by the house, whereas in other areas which differ climatically this preferred environment can only be found outdoors.

[This is only a preliminary survey, and many of the conclusions are tentative. However, the report reveals a wide knowledge of the problem and a critical approach to the whole subject which augurs well for future reports on this comparatively unexplored region.]

R. C. Muirhead-Thomson

MUIRHEAD-THOMSON, R. C. Low Gametocyte Thresholds of Infection of Anopheles with Plasmodium falciparum. A Significant Factor in Malaria Epidemiology. Brit. Med. J. 1954, Jan. 9, 68-70, [12 refs.]

Laboratory-bred *Anopheles gambiae* were allowed to feed on Africans at Weija in the Gold Coast, where the gametocyte rate for *Plasmodium falciparum* declined from 40·4 per cent. in infants to 5·9 per cent. in those 15 years of age or older and the crescent density in different individuals ranged from 0·1 to 24 crescents per 1,000 leucocytes. The infectiousness of a person for the mosquitoes was not simply related to crescent density. Thus, infection rates (for oöcysts) of 30-40 per cent. and average oöcyst counts of about 5 per stomach were obtained from 4 children (2-9 years old) in whom gametocyte densities ranged from 1·2 to 24·0 per 1,000 leucocytes. On the other hands, 5 carriers with 0·1 to 0·52 crescents per 1,000 leucocytes (children aged 2½ to 10 years) infected usually about as many as 10 per cent. of the mosquitoes and oöcyst counts were on the average 1-2 per stomach. The infecting children with low crescent densities are referred to as "cryptic" infectors. Moreover, 6 children of 4 months to 7 years of age and with 3·1 to 7·7 crescents per 1,000 leucocytes failed to infect the vector [numbers of mosquitoes dissected per subject were only 13 to 22]. The highest proportion of non-infective carriers occurred in the 0-1 year age group in which only 2 of 13 crescent carriers infected the mosquitoes.

The conclusion is put forward that crescent density is not a satisfactory criterion of infectiousness to mosquitoes and that there is scope for further large-scale testing of villagers at random by means of test feeds to obtain data on the reservoir from which the vector is infected. It may be too, particularly if preferential biting of older children and adults is considered, that "cryptic" infectors among this older group could be more important than the less frequently bitten, infecting infant.

Attention is drawn to results of similar significance with *P. falciparum*

transmitted by *A. quadrimaculatus* in South Carolina, and *A. albimanus* in Jamaica [this *Bulletin*, 1948, v. 45, 674; 1953, v. 50, 275].

D. S. Bertram

JONES, J. C. **Some Biometrical Constants for *Anopheles quadrimaculatus* Say Larvae in relation to Age within Stadia.** *Mosquito News.* 1953, Dec., v. 13, No. 4, 243-7, 2 text figs. & 8 figs. on pl.

In order to determine larval age, measurements were made of total body lengths, thoracic widths, "collar" length and head capsules. The collar, which is formed round the posterior end of the head by the posterior rim of the epicranial plate, is a useful growth index as it grows continuously during the first three stadia. By measurements of collar length alone, approximations of age within these stadia can be made. Other useful features are darkening of the head capsule and pigmentation of the palmate hairs.

R. C. Muirhead-Thomson

CHARLES, L. J. & SENEVET, G. **The Distribution of *Anopheles albimanus* in the Caribbean Islands.** *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1109-15, 1 fig. [25 refs.]

In the Caribbean *Anopheles albimanus* is mainly confined to the Greater Antilles group, i.e., Cuba, Jamaica, Puerto Rico and Santo Domingo (Haiti and the Dominican Republic).

Previous conflicting reports of this mosquito's presence in the Lesser Antilles group are critically revised, and recent detailed surveys have failed to reveal its presence in Trinidad, Grenada, St. Vincent and Barbados. The malaria epidemic in the last island in 1927 was attributed to introduced *A. albimanus*, but could just as well have been due to imported *A. aquasalis*.

Similarly, *A. albimanus* has not been found recently in St. Lucia, Martinique and Dominica, but its presence was confirmed in Guadeloupe. Guadeloupe and its small island of Marie Galante probably represents the southern limit of *A. albimanus* in the island chain of the Lesser Antilles. The small, 16-mile gap between Marie Galante and Dominica has not been bridged.

It is clear that many early records are unreliable owing to confusion between *A. albimanus* and *A. tarsimaculatus* (*aquasalis*).

R. C. Muirhead-Thomson

ROZEBOOM, L. E. **A Note on the Presence of *Anopheles albimanus* in Barbados.** *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1116.

Material sent to the Johns Hopkins University from Barbados at the time of the malaria epidemic in 1927 included 2 well-preserved adults which are undoubtedly *A. albimanus*, as well as 2 third-stage larvae of the same species. Although *A. albimanus* is now absent from the island, its presence at the time of the epidemic is confirmed.

R. C. Muirhead-Thomson

GUEDES, A. DA S., DE FREITAS, J. R. & XAVIER, S. H. Contribuição ao conhecimento da distribuição geográfica dos anofelinos e algumas observações sobre a biologia do *Anopheles darlingi* Root, 1926, no Estado de Minas Gerais, Brasil. [Geographical Distribution of Anophelines, with Observations on the Biology of *A. darlingi* in Minas Gerais, Brazil] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, Apr., v. 5, No. 2, 157-65. English summary (8 lines).

The authors have made a survey of the anopheline fauna of the Brazilian state of Minas Gerais, confirming and extending the data of earlier workers. They found 20 of 25 species previously recorded and 2 more, bringing the total to 27. The most widely distributed species was *Anopheles albitalis*, followed by *A. argyritarsis* and *A. strobdei*. These mosquitoes were present in about 70 to 80 per cent. of the localities investigated.

A. darlingi was the most important vector, present in about 46 per cent. of the boroughs searched. Of 921 larval foci, 21 per cent. were positive for *A. darlingi*. An analysis of 185 breeding sites of *A. darlingi* showed that ponds and lakes were most favoured (103) followed by calm waters of rivers (57). The sites selected are usually partially shaded, as shown by the classification of the above sites into 157 (partial shade), 15 (in total sun) and 13 (in total shade).

Adult *A. darlingi* were caught in human and animal bait traps and also in houses, where they constituted over 80 per cent. of the anophelines. The numbers of *A. darlingi* per 100 houses inspected amounted to 35. *A. darlingi* were also found resting in fair numbers on the outside walls of houses. *J. R. Busvine*

MERCHANT, S. M. **Paludrine Haematuria.** A Case Report. *Indian J. of Child Health*. 1953, Mar., v. 2, No. 3, 111-12.

"Though Paludrine is a very safe drug, toxic manifestations may appear with overdosage. In order to prevent the complications, one should not exceed the average therapeutic dose which in children is $\frac{1}{4}$ th to $\frac{1}{2}$ of the adult dose of 300 mg. per day for 10 to 21 days."

TREVIÑO V., A., AMANDA REYES, Lydia & MENDOZA M., F. Comunicaciones preliminares sobre el daraprim en el paludismo agudo. [Preliminary Remarks on the Use of Pyrimethamine (Daraprim) in Acute Malaria] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Sept., v. 13, No. 3, 247-52, 1 fig. [13 refs.] English summary.

The authors start by quoting the results reported by previous investigators of the use of pyrimethamine in infections by *P. gallinaceum*, *P. berghei*, *P. cynomolgi* and the human malaria parasites, many of which papers have been abstracted in this *Bulletin* during the past 2 years. The present article deals with 18 subjects with acute malaria treated at the Instituto de Salubridad y Enfermedades Tropicales, Mexico; 6 were natural infections with *P. vivax*, 3 with *P. falciparum*; 9 were neurosyphilites, 7 treated by induction of *P. vivax* and 2 by *P. falciparum*. The temperature was noted every 3 hours and the parasitaemia every 24 hours. Sixteen were treated as follows: initial dose of 50 mgm., another of 25 mgm. in 6 hours, followed by 25 mgm. in 24 hours and again in 48 hours, making a total of 125 mgm. Two of the patients were children and were given half these doses.

Suppression of the febrile attack was obtained in all; in those with *P. vivax* infection the temperature dropped in 52 hours and parasitaemia was not found after 87 hours; in those with *P. falciparum* infection the corresponding times were 58 and 101 hours. Gametocytes were not affected.

The authors conclude that pyrimethamine, in the doses stated, is a very efficacious antimalarial, easily administered and unaccompanied by any toxic symptoms, but its action, both in bringing down the temperature and getting rid of the parasites is slower than that of chloroquine. The observations have been carried on for too short a time to enable a decision to be made regarding the effect of these doses on relapses. *H. Harold Scott*

SÓBERÓN Y PARRA, G. & CERVANTES, D. El "Daraprim", en el tratamiento de las infecciones causadas por *P. vivax* en el Estado de Tamaulipas. [Daraprim (Pyrimethamine) in the Treatment of *P. vivax* Infections in the State of Tamaulipas] *Bol. Epidemiológico*. Mexico. 1953, Apr.-June, v. 17, No. 2, 43-5.

The authors record their experience in the treatment of *P. vivax* infections with pyrimethamine. All the cases were spring relapses of infections acquired for the most part during the previous November to January. Experience with the first four cases demonstrated the inadequacy of single-dose treatment. To the subsequent 26 patients multiple doses were given. For children aged 0 to 5 years the dose was 0.25 gm., repeated after 6 hours and on the 2nd and 3rd days; for children aged 6 to 15 years a first dose of 0.5 gm. was followed by 0.25 gm. after 6 hours and a similar dose on the 2nd and 3rd days; for persons of older age doses as above were given plus a dose of 0.25 gm. on the 4th day. All the patients had *P. vivax* infections and all were undergoing an acute attack when treatment was started and all had well marked parasitaemia. The results were uniformly satisfactory. By the 5th day fever and parasites had disappeared in all cases and there was no subsequent relapse during the 100 days the patients were under observation.

Norman White

MYATT, A. V., COATNEY, G. R., HERNANDEZ, T. & BURTON, H. W. A Further Study of the Toxicity of Pyrimethamine (Daraprim) in Man. *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1000-1001.

The authors have previously shown that the administration of 25 mgm. pyrimethamine daily for 7 weeks to 12 white male volunteers resulted in megaloblastic anaemia in 6 of them [this *Bulletin*, 1954, v. 51, 11]. This amount is far in excess of the therapeutic or suppressive dose.

The present study was designed to test the toxicity of this drug at a dosage sufficient for suppression and to determine whether white and non-white persons were equally tolerant of such dosage.

Previous studies had indicated that 25 mgm. pyrimethamine once weekly was an effective suppressive dose [*ibid.*, 9] and this amount was therefore given to 35 healthy volunteers, 25 non-white and 10 white. Histories were taken and physical examination made before and weekly during drug administration. The full haematological studies and urine examinations described in the previous work were carried out.

No symptoms, signs or abnormal laboratory findings were recorded in any patient and this indicates that the dosage in question may be safely

given to white or non-white persons without untoward reaction (apart from possible cases of idiosyncrasy).
H. J. O'D. Burke-Gaffney

SHUTE, P. G. & MARYON, M. **The Effect of Pyrimethamine (Daraprim) on the Gametocytes and Oocysts of *Plasmodium falciparum* and *Plasmodium vivax*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Jan., v. 48, No. 1, 50-63, 9 figs. on 2 pls.

In a previous paper [this *Bulletin*, 1948, v. 45, 578], the authors described the effect of proguanil on the gametocytes of a Rumanian strain of *Plasmodium falciparum*. Mosquitoes fed on patients harbouring gametocytes of this strain up to 7 days after the drug had been given failed to become infective. In the paper under review similar observations are recorded in respect of infections with the Madagascar strain of *P. vivax* and with a West African strain of *P. falciparum* treated with pyrimethamine.

(1) *P. vivax*

A patient harbouring gametocytes of *P. vivax* (180 males per cmm. of blood) received a single dose of 2.5 mgm. pyrimethamine; batches of mosquitoes (*Anopheles stephensi*) were fed 4, 27, 48 and 72 hours thereafter.

In a second experiment a patient harbouring gametocytes of *P. vivax* (360 males per cmm. of blood) received a single dose of 5 mgm. pyrimethamine; mosquitoes were fed 1, 3, 5, 27 and 50 hours thereafter.

In a third experiment a patient harbouring gametocytes of *P. vivax* (360 males per cmm. of blood) received a single dose of 50 mgm. pyrimethamine; mosquitoes were fed 2, 6 and 22 hours thereafter.

When doses not exceeding 5 mgm. of the drug were given, some of the oöcysts showed signs of degeneration but most developed normally and eventually sporozoites appeared in the salivary glands and the mosquitoes were proved infective.

After a single dose of 50 mgm. pyrimethamine, the percentage of mosquitoes showing oöcysts was but little lower than in the control batch, but the average number of cysts per gut was very much smaller (2 compared with 24), suggesting that many, though not all, of the gametocytes were sterilized in the blood. None of the oöcysts reached maturity and it is concluded that the female parasite was adversely affected by the drug, so that though it might survive long enough to penetrate the gut wall, it was incapable of completing its development.

(2) *P. falciparum*

A patient harbouring gametocytes of *P. falciparum* (1,300 males per cmm. of blood) received a single dose of 25 mgm. pyrimethamine. Batches of *A. stephensi* were fed 3, 6, 10, 23 and 144 hours after the drug was given. The percentage of infected guts was 74 against 100 in the controls, but as with *P. vivax*, there was a striking reduction in the average number of oöcysts per gut (5 compared with 70). None of the cysts reached maturity and even when some growth occurred the nuclei were seen to be disintegrated.

The authors' findings are in harmony with the theory advanced by McGREGOR and Dean SMITH [this *Bulletin*, 1952, v. 49, 663] that the drug acts on the *Plasmodium* at the time of active nuclear division.

From the fact that the gametocytocidal action of pyrimethamine has been shown to be effective when biting occurs as early as 2 hours and as late as 144 hours after administration, it is concluded that the drug could play an important part in limiting malaria transmission.

G. Covell

MASSEGUIN, A. & PALINACCI, A. Premiers résultats d'un essai de chimio-prophylaxie du paludisme sur une population enfantine d'un village de Haute-Volta par le " Malocide ". [First Results of Chemoprophylaxis of Malaria with Malocide (Pyrimethamine) in Children in Upper Volta] Bull. Soc. Path. Exot. 1953, v. 46, No. 5, 673-6.

The investigation here recorded was carried out in Tengrela, a hyper-endemic village in the Upper Volta division of French West Africa; 410 infants and children aged from 0 to 15 years were given a single weekly dose of Malocide (pyrimethamine) as follows:

0 to 2 years	...	...	...	...	12.5 mgm. base
2 to 10 years	...	...	...	25	mgm. base
above 10 years...	...	...	...	50	mgm. base

No antimosquito measures were in operation during the investigation.

At the end of 8 months, the parasite index had fallen from 100 to 1.1 per cent., and the spleen index from 86.6 to 17.1 per cent. The sporozoite index in 104 specimens of *A. gambiae* dissected at the beginning of the period was 7.8 per cent. Dissections carried out on 4 subsequent occasions during the course of the trial failed to disclose any infected anophelines. The cost of the drug averaged less than 8 francs 10 centimes per head per month.

[The authors state that the drug was administered in small doses for reasons of economy and because they considered that this amount would not interfere with the establishment of premunition. The dose given was, however, twice as great as that usually prescribed by British and American workers for prophylactic purposes.]

G. Covell

RAFFAELE, G. & COLUZZI, A. Esperimenti d'interruzione della lotta anti-anofelica in alcune zone malariche. [Experimental Interruption of Anopheline Suppression Measures in a Malarious District] Riv. di Malariologia. 1953, Dec., v. 32, Nos. 4/6, 203-12. English summary.

In the Frosinone Province of Italy a DDT spraying campaign carried on for 3 years resulted in the elimination of malaria. In 1949 the authors reported on the results of the campaign and gave an account of the malarious conditions formerly prevailing in this Province [this Bulletin, 1950, v. 47, 105-6]. In an area where there was formerly endemic malaria spraying was stopped 5 years ago: in other areas where malaria was prevalent in 1945-46 spraying was discontinued 3 years ago. At the present time spraying is limited to restricted areas bordering the Provinces of Latina and Caserta. In spite of the cessation of spraying no case of malaria has occurred. *Anopheles m. labranchiae* and *A. superpictus* which were the chief vectors have not made their reappearance. *A. maculipennis typicus* and *A. claviger* are present and increasing in numbers: none of these was found in houses that had been sprayed during the first 2 years after cessation of treatment; a few adults were found in stables after 3 years. In bedrooms the first adults were captured 4 years after spraying had ceased. Neither of these two species transmits malaria in Italy.

Continued vigilance is necessary. Some of those formerly engaged in spraying are now engaged in the systematic search for mosquitoes and the number of catching stations has been increased. If these precautions be taken it is thought that spraying might safely be discontinued in other

parts of Italy where similar conditions prevail. If this be possible the resulting economies would be considerable.

Norman White

MORIN, H. G. S. L'oeuvre antipalustre de l'Organisation Mondiale de la Santé dans l'Orient dit méditerranéen (E.M.R.). [Antimalaria Work of the World Health Organisation in the Eastern Mediterranean Region] *Riv. di Malariaologia*. 1953, Dec., v. 32, Nos. 4-6, 189-202.

With the assistance of the International Children's Emergency Fund the World Health Organization has inaugurated a series of antimalaria demonstrations in different parts of the world where Regional Bureaux have been installed—in Manila for the West Pacific, in Delhi for South-East Asia, in Alexandria for the Eastern Mediterranean, in Washington for the Americas, in Geneva for Europe, and in Brazzaville for Africa south of the Sahara. This paper summarizes the work accomplished in this field during the last 2 years in the Eastern Mediterranean Region which includes all countries that are members of WHO, from Turkey to Italian Somaliland and from Libya to Eastern Pakistan. Iran and Pakistan have already embarked on national campaigns. Lebanon, Syria and Iraq have demonstration teams at work and envisage for this or next year nation-wide campaigns. The administration of Italian Somaliland proposes to undertake an antimalaria demonstration in 1954. Turkey has acquired considerable antimalaria experience which might be of more benefit to neighbouring countries if the instruction given at the Institute of Malarial Studies in Adana were not exclusively in Turkish. For analogous linguistic reasons the achievements of Israel and Cyprus in malaria control have benefited neighbouring countries less than they might have done. Egypt on the other hand has already lent to international teams the services of 2 malarialogists, 2 entomologists and 2 specialized sanitary inspectors.

Courses in malariology for doctors, entomologists, sanitary engineers and inspectors are shortly to be opened in Cairo with the help of WHO. In Iran, with the help of the Faculty of Medicine of Tehran, a WHO international team have installed a Malaria Institute in which some 50 medical officers have been given a complete course of instruction. Very considerable progress has already been achieved in malaria control, notably in the Caspian region and in the neighbourhood of Tehran. Everywhere the reduction of malaria infection rates augurs well for the future. Hopes are expressed for the establishment of an International School of Malariology in Beirut: the importance of the rôle which such an institution might play is elaborated at some length. A WHO mission have done very valuable malaria control work in Syria.

Norman White

i. BRUCE-CHWATT, L. J. **Problems of Malaria Control in Tropical Africa.** *Brit. Med. J.* 1954, Jan. 23, 169-74. [24 refs.]

ii. BRITISH MED. J. 1954, Jan. 23, 201-2. [10 refs.] **Malaria in Africa.**

i. Dr. Bruce-Chwatt reviews our knowledge of incidence, distribution and importance of malaria, its transmission, our technical ability to control it and the economic and sociological problems connected with control. He emphasizes the need for malaria survey as an integral part of control schemes and the possibility of control by means of residual insecticides, preferably those with a long residual action such as dieldrin.

The distribution of expense in a control scheme is: insecticides 30-50 per cent., labour and supervision 25-40 per cent., transport 10-40 per cent.,

and spraying apparatus and contingencies 2-5 per cent. Although short-lived insecticides may have a temporary high efficiency they involve great increase of the transport, labour and supervision charges and are therefore undesirable. The cost per head of the population for an annual programme in a typical African rural area is about 3s. 3d. for DDT, 2s. 9d. for BHC and 2s. 7d. for dieldrin. In places where malaria is seasonal these costs might be reduced, but in any locality they constitute a continuing burden which may be unwelcome to the administration. Moreover, widely practised control must add to population pressure and therefore provide socio-logical and economic problems. The numerous difficulties, however, will never be solved by ignoring them and a wise policy would include a carefully planned regional programme which ought not to be slowed down to keep in line with the gradual development of other forms of social and economic progress.

ii. The Editor reviews the various impediments which have arisen in the path of malaria control in Africa. The entitlement of the public health authority in our country to prevent the transmission of disease has been put beyond question, and it should be beyond question elsewhere. The real problem is to integrate the various desirable forms of progress, avoiding a lack of balance between them.

G. Macdonald

- i. RÉUNION. Rapport sur la lutte antipaludique, campagne 1950-1951.
[Report of the Antimalaria Campaign of 1950-51] [HAMON, J. & DUFOUR, G.]. 33 pp., 6 folding figs. & 6 coloured folding maps. 1951. Saint-Denis: F. Cazal.
- ii. RÉUNION. Rapport sur la lutte antipaludique, campagne 1951-1952.
[Report of the Antimalaria Campaign of 1951-52] [HAMON, J. & DUFOUR, G.]. 60 pp., 6 folding figs. & 7 coloured folding maps. [11 refs.] 1952. Saint-Denis: F. Cazal.

i. In 1949 Réunion embarked on an ambitious project to eliminate malaria from the island. These two reports describe in detail the progress achieved during the second and third years of the campaign. In 1950-51 chief reliance was placed on the DDT spraying of houses which was carried out in all coastal communes. The population so protected numbered 124,000, about half the total population of the island. No *Anopheles funestus* could be found, its disappearance being attributed to the measures taken [but see below]. *A. gambiae* appeared to be less prevalent but showed a growing tendency to resort to outdoor resting places, as a result of the spraying. Spraying had but little effect on the prevalence of *Culex fatigans*, the important vector of filariasis. The spleen rate decreased during the year from 19 to 9.65 per cent. and the parasite rate from 0.80 to 0.22 per cent. The mortality ascribed to malaria declined in all the treated communes. The year's experience showed that the elimination of *A. gambiae*, the chief malaria vector, would be impossible without antilarval measures.

ii. The 1951-52 report is more comprehensive than its predecessor. The topography and climatic conditions of the Island are described. The population was estimated to be 270,000. An account is given of living and economic conditions. In 1951 the general death rate was 19 per 1,000, the birth rate 51 per 1,000, and the infant mortality rate 157 per 1,000 live births.

The antimarial activity in 1951-52 was much intensified and antilarval

work received much attention. Additions to staff enabled more expert entomological work to be carried out. The disappearance of *A. funestus* was noted in the previous year: further research suggests that that species was never present in the island. Two species of *Anopheles* were identified, *gambiae* and *coustani*: the former is the only vector. During the cold season *A. gambiae* is found only in the coastal plain, but in the warm months it has been found at heights up to 1,200 metres. A further fall in the spleen rate of schoolchildren to 5·9 per cent. was recorded (28·94 per cent. in 1949) and deaths ascribed to malaria formed but 6·6 per cent. of the total mortality (28 per cent. in 1949). Spraying resulted in the almost total disappearance of anophelines from houses. Antilarval measures have justified themselves in populous areas. *Culex fatigans* remains almost as much in evidence as ever: it is the most important vector of *Wuchereria bancrofti*, which is very prevalent. The noteworthy reduction in malaria incidence does not appear to have caused any decline in the very high infant mortality rate. An estimate of cost is given. *Norman White*

PEÑA CHAVARRÍA, A. & GUERRERO ARGUEDAS, J. La influencia del DDT en la incidencia del paludismo en Costa Rica. [Effect of DDT on Malaria Incidence in Costa Rica] *Bol. Oficina Sanitaria Panamericana*. 1953, Nov., v. 35, No. 5, 487-93, 1 map & 1 chart. English summary (8 lines).

Costa Rica, occupying a central position in the isthmus connecting North and South America, covers an area of 51,000 square kilometres, and has a population of 800,875. Malaria is endemic in areas aggregating 61·8 per cent. of the total: in these areas reside 38·2 per cent. of the total population. In 1942 malaria was the second most important cause of death: to it was credited 9 per cent. of the mortality from all causes.

In 1946 DDT residual spraying was carried out in all areas which were under the control of the United Fruit Company. In 1950 the Government with the aid of UNICEF extended the spraying campaign to cover all other malarious areas in the country. The decrease in malaria incidence which has resulted is reflected in the statistical returns of the San Juan de Dios Hospital of San José, which receives patients from all parts of Costa Rica. Malaria cases treated fell from 3,222 in 1942 to 283 in 1952. In the former year malaria was responsible for 1,223 deaths in the country as a whole; in 1952 only 159 deaths were attributed to malaria which now occupies the eleventh place in the list of causes of death. *Norman White*

VINCKE, I., PEETERS, E. & FRANKIE, G. Essai d'étude d'ensemble sur le *Plasmodium berghei*. [General Survey of Research on *P. berghei*] *Inst. Roy. Colonial Belge Bull. des Séances*. 1953, v. 24, No. 4, 1364-406, 1 graph. [97 refs.]

This is a valuable survey by recognized experts of the studies which have been made on *P. berghei* by many workers.

It discusses the parasite, its rodent hosts and vectors, transmission and development in individual rodents. There is a valuable list of animal hosts, classified according to their degree of susceptibility, with a reference to the records in each case. Pathology and immunology are discussed and there is a note on the use of *P. berghei* in chemotherapeutic trials. The addition of nearly 100 references is an indication of the comprehensive nature of this survey.

There is a final note on the need for further research, indicating the gaps in knowledge of the parasite which have still to be filled.

WHITFELD, P. R. **The Uptake of Radioactive Phosphorus by Erythrocytic Stages of *Plasmodium berghei* (Vincke & Lips).** *Australian J. Biol. Sci.* 1953, Nov., v. 6, No. 4, 591-6.

A procedure involving the isolation of malaria parasites free from host tissues has been used in a study of the uptake of ^{32}P by *P. berghei* *in vivo*. The isotope was injected intraperitoneally to infected mice and the parasitized blood was obtained by severing the jugular vein of the host. The number of parasites present was determined in stained smears and total counts of red cells were made in a haemocytometer. Radio-activity measurements were carried out in liquid counters, allowance being made for decay as the half-life period of ^{32}P is 14.3 days. In each experiment 100 mice with approximately 20 per cent. of their red cells infected were injected with 4 microcuries ^{32}P per 25 gm. weight, and the inorganic level of this substance in the plasma was determined after 5 minutes. The remainder of the mice in groups of 12 to 14 were killed at intervals of several hours up to a maximum of 48. Leucocytes were got rid of by allowing the suspended cells to settle in a solution of Dextran. The parasites were freed from red cells by means of saponin and careful centrifugation aided removal of the "ghosts". The phosphorus-containing fractions, namely acid-soluble, lipid, desoxyribonucleic acid (DNA), ribonucleic acid (RNA) and phosphoprotein fractions, were separated by standard methods.

The highest ^{32}P content was found in the lipid fraction, but the greatest incorporation of ^{32}P during the period 2 to 48 hours after injection occurred in the DNA fraction. In the RNA fraction the content of ^{32}P remained fairly constant over the experimental period. Variations occurred in the rate of incorporation of the isotope at different experimental periods, but in general this was faster during the early stages of the experiment.

In conclusion the author writes "Furthermore, a comparison of the ^{32}P content in the nucleotides of nucleic acids isolated from normal and resistant strains of parasites is now possible and might lead to some interesting results". [A paper embodying such results among others for normal and drug-resistant trypanosomes was read by the reviewer in collaboration with Mr. S. CROWTHER at the 5th International Congress of Tropical Medicine and Malaria at Istanbul in 1953.]

J. D. Fulton

SHERWOOD JONES, E., MAEGRAITH, B. G. & GIBSON, Q. H. **Pathological Processes in Disease. IV. Oxidations in the Rat Reticulocyte, a Host Cell of *Plasmodium berghei*.** *Ann. Trop. Med. & Parasit.* 1953, Dec., v. 47, No. 4, 431-7, 1 graph. [30 refs.]

It is well known that *P. berghei* develops preferentially in the rat reticulocyte rather than in the mature red cell and that reticulocytes in general have a higher metabolic rate than older cells. The authors now report a preliminary study on rat reticulocyte metabolism. By repeated doses of 2 mgm. phenylhydrazine per 100 gm. rat given intraperitoneally a marked reticulocytosis was produced. The heparinized blood was centrifuged and after removal of the plasma and buffy layer, the cells were repeatedly washed in 0.01 M phosphate buffer in physiological saline containing 0.01 M glucose. Reticulocytes present in the blood of rats recovered from *P. berghei* infections numbering 70 to 100 per cent. of the total were also used.

The oxygen uptake of these cell suspensions was measured at 38°C. by conventional procedures, and found to be linear in presence or absence of

glucose, was cyanide sensitive but was not correlated with haemoglobin content. Aerobically small amounts of pyruvate and large amounts of lactate were formed. Iodoacetate and fluoride caused marked respiratory inhibition. Citrate accumulated when fluoroacetate, which gave rise to respiratory inhibition, was present. It appeared that the carbohydrate metabolism of reticulocytes from both sources was similar. Malonate and arsenite also caused decreased oxygen uptake by these cells. The authors conclude on indirect evidence that they have demonstrated the Krebs cycle, a series of reactions involving oxidation of pyruvate, in the rat reticulocyte.

J. D. Fulton

- i. HAWKING, F. **Milk, p-Aminobenzoate, and Malaria of Rats and Monkeys.** *Brit. Med. J.* 1954, Feb. 20, 425-9, 4 figs. [18 refs.]
- ii. BRITISH MED. J. 1954, Feb. 20, 447-8. **Milk and Malaria.**

i. MAEGRAITH *et al.* [this *Bulletin*, 1953, v. 50, 384] showed that various milk diets supplemented by vitamins were able to suppress or radically cure a blood-transmitted infection of *P. berghei* in rats. BRAY and GARNHAM [*ibid.*, 1953, v. 50, 1121] showed that *P. cynomolgi* infections of monkeys were also suppressed when induced by blood inoculation or mosquito transmission, but in no case was suppression complete. Pre-erythrocytic schizonts, sporogonic stages and merozoites did not seem to be affected by milk diet but its adverse effect was noticeable on immature blood schizonts, chiefly at the stage of active division. The present author showed [*ibid.*, 1953, v. 50, 1122] that *p*-aminobenzoic acid (PAB) in the milk diet could reverse its suppressive effect. This substance was known from the work of ANFINSEN *et al.* [*ibid.*, 1945, v. 42, 867; 1947, v. 44, 1043] to be essential for the successful culture of certain plasmodia. The concentration required in milk approached an intake corresponding to 20 mgm./kgm. weight per day and could be replaced by folic acid. The suppression of infection in rats and monkeys by a diet deficient in PAB was correlated with the effect of sulphonamides on the parasites in question.

The original authors drew attention to the analogy between their findings in rats and the frequent absence of severe malaria infection in young infants in endemic areas of the infection, and have since conducted investigations in the field. The present author carried out experiments in suckling rats and monkeys. PAB was given to the mother or young by injection or was smeared on the mother's nipples so that it should reach the young by the oral route. It was found that PAB caused a notable increase in infection with *P. berghei*, *P. cynomolgi* and *P. knowlesi* in the respective hosts when they were fed on a milk diet. The relationship of PAB to the action of pyrimethamine [Daraprim] and proguanil [Paludrine] is discussed.

ii. The subject of milk and malaria, dating from the discovery of MAEGRAITH and colleagues, is briefly dealt with in an annotation in the same journal, and various aspects have been mentioned in the above abstract. In addition, attention has been drawn by RODHAIN to the fact that infection with piroplasms which live in red cells, but do not metabolize haemoglobin, are unaffected by a milk diet. On the other hand, ALLISON [above, p. 526] has shown that haemoglobin altered in persons with the sickling trait is inimical to infection by certain plasmodial species. The exact significance of the rôle played by haemoglobin in the phenomenon has yet to be determined.

J. D. Fulton

RAMAKRISHNAN, S. P., SATYA PRAKASH & KRISHNASWAMI, A. K. **Studies on Plasmodium berghei n.sp. Yincke and Lips, 1948. XI. Haematology of Blood-Induced Infections in Albino Rats.** Indian J. Malariaiology. 1953, June, v. 7, No. 2, 93-102. [22 refs.]

The authors studied the blood changes in adult white rats infected with *Plasmodium berghei* by intraperitoneal inoculation of 80,000 parasites in each. Blood cell counts were made by standard methods in samples taken once a day. For differential counts, dry-fixed films were stained by the JSB method, the number of parasites being calculated per 10,000 red blood corpuscles. For staining reticulocytes, a drop of 1 per cent. brilliant cresyl blue was mixed with a drop of blood, after which a smear was made and stained as above.

The results were as follows. The normal erythrocyte count (6·4 million per cmm.) fell to 4·6 million in the acute phase of the infection, rising again to 6·7 million during the latent period. In the course of a relapse the count again fell to 5·6 million. As the erythrocytes were destroyed, the number of polychromatophile cells rose, about 70 per cent. of these being represented by reticulocytes.

The predilection of this parasite for immature erythrocytes, noted by previous workers, was confirmed. In polychromatophile cells pigment was seen only in full-grown schizonts, whereas in mature red cells it was visible in most stages of the parasite. A slight degree of leucocytosis was observed during parasitaemia in the acute period of the infection, persisting for 10 days in early latency, but followed by leucopenia during relapse. Leucocytosis is attributed to a relative increase in neutrophiles. The monocytes did not increase during the acute and early latent phases, but rose in numbers when latency became established. Lymphocytes diminished in numbers in the acute and early latency periods, but increased during the established latent period and in relapse.

Details of the haematological changes are given in 7 Tables.

C. A. Hoare

KRISHNASWAMI, A. K., SATYA PRAKASH & RAMAKRISHNAN, S. P. **Studies on Plasmodium berghei n.sp. Yincke and Lips, 1948. XII. Attempts to Estimate *in vivo* the Acquired Immunity in Albino Rats.** Indian J. Malariaiology. 1953, June, v. 7, No. 2, 103-6.

The investigation described in this paper was undertaken with the view to providing a quantitative evaluation of the degree of immunity acquired in white rats infected with *Plasmodium berghei*, by challenging them by repeated superinfection with progressively increasing doses of the homologous strain of parasite. Rats with untreated blood-induced infections were inoculated intraperitoneally between the 1st and 13th days of latency with challenge doses from 1 million to 2 milliard parasites. Their blood was examined daily and parasitaemia was estimated in films stained by the JSB method by parasite counts per 10,000 erythrocytes.

Attempts to estimate the acquired immunity quantitatively *in vivo* were unsuccessful, for out of 35 superinfected rats only 19 showed a few parasites up to 4 days. Even with the highest challenge doses (2 milliard parasites) the immune recipients showed only about 1 per cent. infection next day, but none 2-4 days later. In contrast, in non-immune controls receiving similar doses, parasitaemia increased progressively, killing the rats within 6 days.

The above strain was compared with another strain of *P. berghei*, maintained in the same laboratory, by cross-immunity experiments: they proved to be immunologically identical.

C. A. Hoare

PAUTRIZEL, R. & NGUYEN-VINH-NIEN. Mise en évidence d'anticorps chez le rat parasité par *Plasmodium berghei*, à l'aide d'un antigène préparé avec du sang de rat impaludé. [Demonstration of Antibodies in Rats Infected with *Plasmodium berghei* by Means of an Antigen Prepared from the Blood of Infected Rats] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 671-3, 2 figs. on pl.

Heparinized blood of rats infected with *Plasmodium berghei* was centrifuged in the presence of polyvinylpyrrolidone and the parasitized corpuscles were thereby separated. The latter were haemolysed and the deposit, containing parasites and erythrocyte débris, was treated with trypsin for 20 hours at 25°C. to remove the stroma. After centrifuging again, the deposit was washed several times with glucose saline and finally was successively frozen and unfrozen. This solution possessed a clear brown colour and was used after dilution as the antigen in the complement-fixation reaction (16 hours at 6°-8°C.). The results were clear-cut and varied according (a) to the age of the infection, and (b) to superinfection. The reaction began to appear on the 12th day, rose to a maximum after about 26 days and then gradually fell; the sera of hyperimmunized rats gave very strongly positive reactions in dilutions up to 1/70. [See also VARGUES, this *Bulletin*, 1952, v. 49, 602.]

P. C. C. Garnham

GRIGNASCHI, V. J. Cortisona e inmunidad hemopprotozoárica natural y adquirida. [Cortisone and Immunity in *Plasmodium gallinaceum*] *Semana Méd.* 1953, Sept. 17, v. 103, No. 12, 411-16, 3 graphs. [25 refs.]

This paper describes the results of experiments on the effect of cortisone upon natural and acquired immunity in infections with *Plasmodium gallinaceum*. Two batches of 12 fowls each were inoculated intramuscularly with 80×10^6 infected erythrocytes taken from the donor at the height of parasitaemia. Cortisone acetate (Merck) was administered 5 days before the blood inoculation, one batch receiving 1 mgm., the other 1.5 mgm. per 100 gm. of body weight. This treatment was continued during the whole period of the experiments. In a control group of infected fowls no cortisone was given. The following criteria were employed in the assessment of the influence exerted by the hormone upon the development of immunity: (1) duration of the incubation period, (2) degree of parasitaemia, (3) changes in the erythrocytic cycle reflecting direct action upon the parasites, (4) presence or absence of parasitological crises, (5) presence or absence of exo-erythrocytic development, (6) length of life of the host from the time of inoculation. A comparison of these data in the treated and control fowls revealed no significant differences attributable to the action of cortisone.

C. A. Hoare

GRIGNASCHI, V. J. Cortisona e inmunidad natural relativa hemopprotozoárica. [Cortisone and Natural Immunity against *Plasmodium gallinaceum*] *Exper. Parasit.* New York. 1954, Jan., v. 3, No. 1, 30-37, 1 graph & 2 figs. [14 refs.]

The English summary appended to the paper is as follows:—

"Six pigeons (*Columba livia*) were injected during a 22-day-period with 1.5 mg of cortisone (Cortone, Merck) daily for 15 days followed by 1 mg/100 g of body weight, for 7 days. On the fifth day of treatment, the six treated pigeons as well as six untreated ones were inoculated with known numbers of erythrocytic forms of *Plasmodium gallinaceum*. The animals were bled at regular intervals. Blood was examined for parasites and

subinoculated into susceptible chickens. Also brain and spleen-liver suspensions were inoculated into clean chickens on the forty-fifth day after infection, when all of the animals were sacrificed. Statistical analysis of the data revealed no significant difference in the disappearance of parasites in the cortisone-treated from the untreated pigeons. Therefore, use of the hormone did not alter the degree of natural immunity against *Plasmodium gallinaceum*.

"Macroscopic as well as microscopic examinations of the tissues gave evidence of the action of the hormone, as has been reported by various investigators."

WARREN, L. & MANWELL, R. D. **Rate of Glucose Consumption by Malarial Blood.** *Exper. Parasit.* New York. 1954, Jan., v. 3, No. 1, 16-24, 3 figs. [12 refs.]

In earlier experiments Manwell and colleagues have studied glycolysis in *P. gallinaceum* and cultural conditions for a number of avian plasmodia [this *Bulletin*, 1949, v. 46, 1011; 1951, v. 48, 335] in which the medium of BALL *et al.* [*ibid.*, 1945, v. 42, 867] was used. They have now made similar studies on the consumption of glucose by *P. relictum* in ducklings with a view to a better understanding of cultural conditions for plasmodia in general. Heparinized blood was drawn at the height of infection and kept shaken in the Harvard medium [this *Bulletin*, 1947, v. 44, 1044]. The glucose consumed was based on parasite surface area as described by SILVERMAN *et al.* [*ibid.*, 1945, v. 42, 448], the asexual forms being divided into 3 groups according to the number of chromatin masses present, and gametocytes formed a fourth group. The viability of samples after shaking was tested by inoculation to ducklings.

Rates of glucose consumption for normal, anaemic and parasitized blood were determined. Reticulocytes had a higher metabolic activity than mature red cells and *P. relictum* consumed more glucose than either. Its consumption was also greater than that of *P. gallinaceum*. Mature duck red cells consumed more glucose than those of chicks. There was no significant difference in glucose level of normal and parasitized blood under the conditions of experiment, and the pH value changed but little. The authors believe that the physiological character of the red cells of different avian hosts influences the degree of susceptibility to malarial parasites.

J. D. Fulton

DAVID, A. & KRISHNAN, K. S. **Some Observations on Experimental Infections in Domestic Pigeons (*Columba livia* Gmelin) with *P. relictum*.** *Indian J. Malariology.* 1953, June, v. 7, No. 2, 113-15.

The susceptibility of pigeons to local strains of *Plasmodium relictum* was tested in Delhi. Adult pigeons were used except for one young bird reared in a screened cage. The parasite was obtained either in the erythrocytic form from infected sparrows or in the sporozoite form from laboratory-bred *Culex fatigans* which had previously fed on sparrows. The parasite was then inoculated into 8 pigeons and into house sparrows as controls; 12 out of 21 of the latter became positive, but none of the pigeons. Observations were continued for as long as 138 days. Five pigeons were given sporozoites in massive numbers, either intravenously or by allowing infected mosquitoes to bite, but again no infection resulted. Examination of the blood of 214 pigeons from the same locality by JASWANT SINGH *et al.* [see this *Bulletin*, 1952, 49, 674] showed that the parasite was absent, and the authors conclude that the Delhi pigeons are insusceptible to the local strain of *P. relictum*.

relictum. [It would be interesting to know if these pigeons are susceptible to exotic strains of the parasite.]

P. C. C. Garnham

RAY, A. P. & BHATNAGAR, V. N. **Avian Plasmodium in Indian Birds.**

Part I. *Indian J. Malariaiology.* 1953, June, v. 7, No. 2, 121-4, 1 chart & 15 figs. on pl.

A malaria parasite resembling *Plasmodium rouxi* was found in a partridge (*Francolinus pondicerianus interpositus*) bought in a market in Delhi. The parasite was of the usual small size with only 4 merozoites, often in the form of a cross, and had elongated gametocytes. Blood smears were taken every 4 hours, and the periodicity of the asexual cycle was shown to be quotidian; there was little synchronicity of growth. This was at first said to be the only record of a malaria infection in the common Indian partridge, but the authors have since described another one from the same batch of birds, which they have apparently identified as *P. polare* [this *Bulletin*, 1954, v. 51, 24].

P. C. C. Garnham

RIAZ-UL-HASSAN, S. **Further Observations on Malaria in Buffaloes.**

Pakistan J. of Health. 1953, July, v. 3, No. 2, 59-63, 1 coloured pl.

The author reports observations on malaria in Indian buffaloes, which were carried out between 1936 and 1938 but remained unpublished. The total number of animals examined was over 1,000, the average percentage infected with *Plasmodium bubalis* being 3·1 per cent. The symptoms of the disease are a fever (103-105°F.) usually lasting 1-2 days, followed by a mild course for up to 14 days, after which spontaneous recovery takes place. However, in some cases there is digestive disturbance accompanied by diarrhoea, while in a minority the disease may be acute and terminate fatally. The pathological changes are said to resemble those found in human malaria. During the patent phase of the infection all stages of the parasite, including gametocytes, are seen in the blood. The vector of *P. bubalis* remains unknown.

C. A. Hoare

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—human, animal; American—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

COLONIAL OFFICE. **Colonial Research 1952-1953. Tsetse Fly and Trypanosomiasis Committee.** Report for 1952-1953 [BARNES, W. L. G., Chairman] (pp. 235-49). Cmd. 8971. 268 pp. 1953, Oct. London: H.M. Stationery Office. [7s. 6d.]

Part I of the report briefly notes changes in the membership of the committee. Part II records the work of the East African Tsetse and Trypanosomiasis Research and Reclamation Organization covering in a briefer way the matter to be found in the annual report of this Organization for 1952; this has already been quite fully abstracted [this *Bulletin*, 1953, v. 50, 1018]. Part III deals with the progress of the West African Institute for Trypanosomiasis Research which has now been able to extend its

activities from Nigeria to include Sierra Leone and the Gambia. Field research on *Glossina palpalis* in Northern Nigeria has been concluded and published [this *Bulletin*, 1953, v. 50, 1124] and arrangements are in progress to undertake studies on tsetse of forests as well as continue current research on *G. morsitans*; the latter work has exposed a serious advance of this fly in Northern Nigeria. Laboratory rearing of *G. palpalis* is maintained at a rate of 1,000 flies per month; rearing of *G. morsitans* is being developed.

A brief report is given of epidemiological surveys of human trypanosomiasis in the Gambia and in Sierra Leone. In the Gambia, *G. palpalis* is the only vector, although *G. morsitans* is present and also, though less widespread, *G. longipalpis*. The disease is hyperendemic in some up-river villages close to the perennial foci of the fly, but is elsewhere of light or moderate incidence. *G. palpalis* is also the sole vector in Sierra Leone. The potentialities in Sierra Leone for an epidemic in savannah country and its transition zone to rain forest are considerable and call for constant vigilance.

Prophylactic pentamidine is under test in 2,500 inhabitants in one of the provinces of Nigeria and is promising. After 9 months no cases occurred in treated persons against 9 cases among those untreated. Antrycide methyl sulphate has proved effective curatively in over 30,000 cattle and in dogs, but it is highly toxic to horses and not very satisfactory against *T. simiae* in pigs. Satisfactory results on a small experimental scale have followed chemoprophylactic use for 1-2 years of antrycide pro-salt to protect cattle. A strain of *T. congolense* has rapidly increased its resistance to 10 times its original sensitivity to 0.5 mgm./kgm. antrycide methyl sulphate. There is some prospect of good results with new drugs designated as "528" and Ethidium Bromide.

Work is in progress on the nature of the tolerance of Ndama cattle to trypanosomes and on the possibility of inducing tolerance or immunity in other breeds protected by antrycide.

T. vivax is now maintained in the laboratory in white rats with, and without, supplementary inoculations of "clean" sheep or ox serum at passage. Both lines have been passaged over 100 times and they were still transmissible by *G. palpalis* by this stage. They are morphologically indistinguishable although, for a time, the course of the infection differed in the 2 lines. Their adaptation to rats is lost if passage is made through sheep. There appear to be differences of a material kind between strains of *T. vivax* from East Africa and from West Africa, but not from within Nigeria.

Part IV notes a number of general matters, mainly of administrative interest, but it calls attention to the publication by H.M. Stationery Office of *Animal Trypanosomiasis in Eastern Africa, 1949* by H. E. HORNBY [this *Bulletin*, 1953, v. 50, 17].

D. S. Bertram

EVENS, F., SCHOENAERS, F., NEUJEAN, G., KAECKENBEEK, A. & STYNS, J.

Valeur pratique de la réaction de fixation du complément dans la maladie du sommeil à *T. gambiense*. II^e Partie: La réaction de fixation du complément lors d'une rechute après traitement médicamenteux.

[Practical Value of the Complement-Fixation Reaction in Sleeping Sickness due to *T. gambiense*. Part II. The Reaction During a Relapse After Specific Treatment] *Ann. Soc. Belge de Méd. Trop.* 1953, Oct. 31, v. 33, No. 5, 389-402.

The authors have already recorded their studies on the specificity of the complement-fixation test for the diagnosis of untreated Gambian sleeping

sickness [this *Bulletin*, 1953, v. 50, 1023]. In the present paper they examine its value in diagnosis during a relapse of the same disease following specific treatment. The determination as to when relapse occurred in their cases was based either on the recovery of trypanosomes—by gland puncture, by blood examination (both direct and after centrifugation), by blood culture, or by examination of the cerebrospinal fluid [CSF]—or else by physical and chemical changes in the CSF held to be indicative of a relapse. It is here assumed that the complement-fixation test becomes negative after successful treatment; further work will be published to substantiate this claim. Of the 65 cases under immediate study in which relapse followed treatment, the relapse in 39 (60 per cent.) of the cases was demonstrably parasitic, while in the other 26 (40 per cent.) it was revealed by changes in the CSF. In a table are set out the numbers of relapse cases which had been treated with Bayer 205, pentamidine, tryparsamide, Bayer 205 plus tryparsamide, Melarsen oxide, Mel B or its equivalent "Arsobal", and other combinations of drugs, and the proportions respectively diagnosed by recovery of parasites or else by CSF changes.

In 47 of the 65 cases of relapse the complement-fixation test was done immediately the relapse became manifest; in the other 18 cases it was not done until some time after the relapse had again been treated specifically. The relevant history and the results of the examinations of each case are briefly set out, and the results of the test are classified and analysed in a series of tables. From these it emerges that in 13 cases (20 per cent.) there was a negative test and in 52 cases (80 per cent.) a positive test, weak in 19 cases (36.5 per cent.) or strong in 33 cases (63.5 per cent.). The test detects about 15 per cent. less cases during relapse after treatment than cases which have not had any previous treatment. Nevertheless the test in the diagnosis of relapse is superior to the other methods of diagnosis dependent on the recovery of parasites, the ratio being 80 per cent. positive against only 60 per cent. with parasite recovery as the sole criterion of relapse. As a rule the test is less strongly positive during relapses than it is in untreated cases, and with recurring relapses the proportion of negative tests increases. When a blood complement-fixation test is negative, the test is also negative when performed with the CSF. The test during relapses is usually more strongly positive when parasites can be found than when the diagnosis rests only on CSF changes. In some cases in which the test is negative during a relapse it may become positive some months after treatment of the relapse. The authors consider that regular performance of the complement-fixation test from the start of the disease (before it is treated) enables them not only to detect relapses, but also to determine whether reappearance of the disease after treatment is due to relapse or to reinfection. Though parasitic relapses following tryparsamide treatment as a rule occur within 8 months, they may be deferred for as long as 4 years, and then the CSF may not materially be altered. A. R. D. Adams

FRIEDHEIM, E. A. H. **MSb and MSbB in the Treatment of Sleeping Sickness due to Infection with *Trypanosoma gambiense*.** *Ann. Trop. Med. & Parasit.* 1953, Dec., v. 47, No. 4, 350-360. [15 refs.]

MSb [this *Bulletin*, 1946, v. 43, 1124] and MSbB are melaminylin compounds, and are the antimony analogues of the arsenicals Melarsen and Mel B. A single dose of the first of them has already been shown by a number of workers to afford protection against trypanosomal and against filarial infections in experimental animals.

MSb, which is polymerized *p*-melaminylphenylstibonic acid, contains 36.2 per cent. of antimony in the pentavalent form. It is soluble in aqueous bicarbonate solutions, but not in water, acids, or organic solvents. It can be given by subcutaneous, intramuscular or intraperitoneal injection in aqueous alkaline solutions, or as a suspension of the free acid in oil or water. As the latter it causes only passing discomfort on injection, but its injection in an alkaline solution results in painful infiltrations. Both the free acid and the alkaline salts are well tolerated and effective when given orally. Intravenous injection causes severe shock, probably owing to the colloidal properties of the aqueous solutions.

MSbB, which is 4-melaminyl-1-[methylocyclo(ethylenedithiastibino)]benzene, contains 27.4 per cent. of antimony in the trivalent form. It is a stable trivalent aromatic antimonial with a trypanocidal activity comparable to that of the most effective arsenicals, and of course is devoid of their risk of causing arsenic encephalopathy.

Experiments on mice suffering from trypanosomal infections show that with single doses intraperitoneally the acute toxicity of both MSb and MSbB is in an LD₅₀/CD₅₀ ratio of about 100. Experiments on rats with prolonged dosage of either compound show that MSb is well tolerated in daily doses of 50 mgm./kgm. for 30 days, and MSbB in doses of 5 mgm./kgm. daily for a similar period. [The method of administration of the drug in the latter case is not stated.] Twelve first-stage parasitically proven human cases of *Trypanosoma gambiense* infection were treated with daily intramuscular injections of MSb for 9 to 12 days. The dose was 0.006 to 0.022 gm./kgm. on each successive day, and the drug was given as a micronized 10 per cent. suspension in 4 volumes of refined peanut oil and 1 volume of ethyl oleate, with 6 per cent. butesin, 1 per cent. procaine base, and 1 in 20,000 metaphen added. The highest gross dosage used was 5.7 gm. given over 12 days; this, given to one patient, was followed 7 days later by a follicular rash, on the chest, back and thighs, and some malaise, which lasted for 5 days; no evidence of toxicity was observed in the other cases. Trypanosomes vanished from the blood or glands or both in one case after 7 days, in 1 after 6 days, and in the other 10 within 24 hours after the initial injection.

Four similar patients were treated with MSb orally; one of the 4 was a second-stage case. The daily dosage was 0.01 to 0.02 gm./kgm., and this was continued over 5 or 6 consecutive days. The second-stage case was free from demonstrable parasites within 48 hours of the initial injection, and 3 months later the cerebrospinal fluid [CSF] was normal. Of the 3 first-stage cases, 2 were freed of demonstrable parasites within 24 hours and 3 days respectively; the remaining patient's parasites were still demonstrable 8 days after treatment, but were absent at 1, 7, 13 and 24 months later; but at the 24th month the cellular content of the CSF was 24 per cmm. and the protein was 0.5 mgm. per cc., which suggested a relapse of the disease.

Seven patients with trypanosomiasis were treated orally with MSbB over a period of 9 to 15 days. The daily dosage of the free acid was 0.005 to 0.016 gm./kgm. In some cases the treatment, which was given daily, was interrupted for 1 to 14 days after 3 to 5 daily doses to observe the possible cumulative effect of the drug. Two patients had first-stage and 5 second-stage infections. In 3 cases with demonstrable lymph gland or blood infections, or both, the parasites vanished within 24 hours of the initial dose (0.008 gm./kgm.); and in 2 other cases with similarly demonstrable infections they had vanished within 40 hours of the initial dose; these last 2

patients were examined repeatedly for 2 years and 5 months respectively, and both remained well. In 3 of the second-stage cases, with a high cellular CSF content and also trypanosomes in the CSF, who were given a total dosage of 0·047 gm./kgm. in 23 days, 0·07 gm./kgm. in 27 days, and 0·10 gm./kgm. in 32 days respectively, the CSF cellular content was reduced to near normality and the parasites had vanished within 10 days of receiving the first 5 doses of the drug; but all 3 relapsed in 1 year. Another patient in the second stage was therefore given a higher dosage of the drug over a shorter period (0·10 gm./kgm. in 17 days); the immediate result was as good, and the CSF remained normal 29 months later; after the first 5 daily doses this patient suffered from vomiting and diarrhoea, so abstention from the drug for a couple of days was deemed desirable.

The author concludes from the foregoing that MSb has a relatively slow but long-lasting effect on the trypanosomes, whereas though MSbB acts quickly on the parasites, dosage with it for at least 10 days is necessary to ensure sterilization of the infection. He therefore thinks that intramuscular treatment with MSb combined with oral treatment with MSbB promises both a prompt clearance of trypanosomes and a lasting effect; it affords, also, prophylaxis against re-infection for a month. Accordingly he treated 124 patients (98 first-stage and 26 second-stage infections) in this manner, in most cases as follows:—

MSb: Intramuscular injection into each buttock on first, second, fourth, fifth and seventh day of treatment.

Single dose: 0·01 gm./kgm. with a maximum dosage of 0·5 gm.
Number of doses: maximum 5.

MSbB: By mouth, one dose daily in gelatin capsules each containing 0·15 gm.

Single dose:

15–30 kgm. body weight, 1 capsule (0·01–0·005 gm./kgm.)							
31–55 , , , , 2 , , (0·01–0·055 , , }							
56 , , , , 3 , , (0·08 , ,)							

Number of doses: maximum 7.

Results are set out in 2 tables; from these it appears that of the 98 first-stage patients treated, from 70 to 100 per cent. were cured, as judged by a 2-year observation period; the variations in the cure rate were directly related to the amounts given of the 2 drugs. In the 26 second-stage patients treated, who were watched for periods of 1 to 2½ years, the results were similar, relapse being assumed in 7 of them on the basis of failure to revert the CSF to normal. The number of cases is too small for statistical analysis of the therapeutic results as a function of dosage. There were no gross signs of toxicity during the treatment, and the gastrointestinal manifestations were trivial. In one case there was a follicular rash of short duration. No encephalopathy or peripheral neuritis occurred.

The author is of the opinion that the combined treatment is capable of wide variation, and that the optimum must be determined by further trials. Each of the compounds, MSb and MSbB, is separately capable of curing each stage of *T. gambiense* infection; the combination of the 2 concurrently reduces the time necessary for effective treatment to 3 to 7 days.

A. R. D. Adams

SILVA, M. A. DE A. 1. Aspectos epidemiológicos da tripanosomíase rhodesiense, em Moçambique. [Epidemiology of Infection by *Trypanosoma rhodesiense* in Mozambique] *Anais Inst. Med. Trop.* Lisbon. 1952, Sept., v. 9, No. 3, 691-712, 2 folding maps. [27 refs.]

The epidemiology of Rhodesian trypanosomiasis is in some respects still obscure. Thus, we do not know why it is permanently endemic in certain areas, but absent from others in which the general conditions would seem to be exactly similar; the vector *Glossina morsitans* the same, the people the same and their mode of life and occupations the same and the climate apparently the same. In this article the author discusses in turn the geographical distribution of trypanosomiasis in Mozambique, with a brief note on the history of the disease and a map showing the spread of infection during 43 years to 1952; and also a table setting out the number of cases year by year from 1940 to 1951 inclusive in 5 regions of the country, noting particularly epidemic outbreaks in Mocimboa da Praia, starting in 1942 and prevailing during the 3 following years. *Glossina morsitans* is the chief vector, but *G. pallidipes* is also responsible for spreading infection in some districts. A second map illustrates the geographical distribution of the commonest species of tsetse fly at the end of 1948, viz., *G. morsitans*, *G. pallidipes*, *G. brevipalpis* and *G. austeni*, the most densely infested part being that where the first two exist together.

The question is discussed from several angles, the people, the vector, the trypanosome itself and the means for dealing with the disease. The author does not reach any very definite conclusions on the subjects indicated in the title, beyond the somewhat vague statement that control of the people and measures to eradicate the vector, searching out of cases, treatment of patients, hospitalization if necessary and chemoprophylaxis of the remainder, must all be taken into consideration and the most important is thought to be concentration of the people into large villages (*aldeamentos*) and gradual eradication of the vector in each of these settlements, as has been done for many years in Tanganyika according to the method adopted by Maclean.

H. Harold Scott

WAGNER, W. H., PEDAL, H. W. & SCHÖNEBERGER, A. Untersuchungen über das Wesen der erworbenen Resistenz von Trypanosomen gegenüber Phenylarsenoxyden. [Studies on the Nature of Acquired Resistance of Trypanosomes to Phenylarsenoxides] *Ztschr. f. Tropenmed. u Parasit.* Stuttgart. 1954, Jan., v. 1, 81-96, 5 figs. [28 refs.]

The early studies of EHRLICH and colleagues on the production of drug resistance in Trypanosomes led to the formulation of certain theories to explain the phenomenon. The mutation theory excludes participation of the drug in the production of resistance; it is believed merely to act as a selective agent for those forms of the parasite which have already undergone mutation. It is not clear whether bacterial resistance involves different processes and whether enzymes play a part. Resistance to one substance generally involves resistance to a number of other related or even unrelated substances. In the case of resistance to phenylarsenoxide, with some exceptions, a group specificity is apparent, according to whether the substituent groups are acidic or basic in character.

Experiments by different authors on the nature of the electric charge in trypanosomes have given no clear-cut results in the problem of resistance. Inhibition of enzymes, especially those containing the -SH group and the difference in content of these groups in normal and resistant strains, has

also led to equivocal results. It has been recently suggested by SCHUELER [this *Bulletin*, 1948, v. 45, 313] that in the process of acquiring resistance to drugs the iso-electric points of some of the trypanosome proteins are altered, and he demonstrated changes in staining reactions of normal and drug-resistant forms of the same strain. The present authors have laid emphasis on the physical properties of the substances under investigation. They used a normal strain of *T. brucei* and other strains made resistant to salvarsan, which is of basic character, and to spirotrypan, a complex arsenical with basic and acidic groups. A strain resistant to an arsenical with acid substituent groups was not available. Relative resistance to different agents was determined *in vitro* by measuring inhibition of oxygen uptake in Warburg flasks, with phenylarsenoxide as standard. The effect on respiration of substances containing a basic, acidic or neutral group in this molecule, was then noted.

Adsorption studies of selected dyestuffs by the different strains of trypanosome were made by obtaining the parasites free from other cells by centrifugation and allowing them to come in contact with dilute solutions of the colouring reagents at the desired pH. The amount of colouring material absorbed was determined by optical measurements on the supernatant after removal of trypanosomes by centrifugation. The data obtained indicate that resistance was real against acidic or basic derivatives but not against phenylarsenoxides with neutral substituents. Inactive dyestuffs of acid character were specially strongly absorbed by trypanosomes resistant to basic phenylarsenoxides and *vice versa*. The conclusion was reached that the electric charges of chemical agents on one hand or of the trypanosome surface on the other are probably responsible for the activity of these agents against the different strains of trypanosomes. *J. D. Fulton*

CANTRELL, W. Diminished P^{32} Assimilation by *Trypanosoma equiperdum* in the Rat Late in the Infection. *J. Infect. Dis.* 1953, Nov.-Dec., v. 93, No. 3, 219-21.

It was shown by earlier authors [this *Bulletin*, 1948, v. 45, 587] that ^{32}P was rapidly incorporated into various phosphorus-containing fractions of *T. equiperdum* both *in vitro* and *in vivo* in the rat. The present author, in using the techniques for the study of drug action, found that the results appeared to be influenced by the degree of infection and has now investigated this possibility. The ^{32}P was injected into the femoral vein of rats at the dosage of 200 microcuries per kgm. weight in saline and contained negligible amounts of phosphorus. The trypanosomes were obtained by centrifugation of citrated rat blood, and after the deposit had twice been washed in saline, a 1 in 10 suspension of the trypanosomes was examined for the presence of leucocytes which were avoided by collecting only the upper half of the trypanosome layer in the first instance. Parasite counts were made in a haemocytometer. The trypanosomes were fractionated into 4 phosphorus-containing fractions, respectively known as acid-soluble, phospholipid, nucleic acid and phosphoprotein fractions. Radio-activity was measured in liquid samples with a Geiger-Muller counter.

It was found 2 hours after ^{32}P injection that the amount of this substance incorporated in each fraction of the trypanosomes was inversely proportional to the intensity of infection in the rat, but at the end of the experiment there was negligible difference in ^{32}P content. Practically all the ^{32}P in the plasma was present as inorganic phosphate. The difference in ^{32}P in the heavy and lighter infections has been ascribed to differences in metabolic

rate in the 2 populations. It appears to the author when the effect of ^{32}P incorporation is studied that the level of infection should be as constant as possible.

J. D. Fulton

NEAL, R. A. & EL AMIN EL KARIB. The Chemotherapeutic Action of Phenanthridine Compounds. Part VII. The Effect of 2:7-Diamino-9- α -Thienyl-10-Methylphenanthridinium Chloride 621C47) upon Infections with *Trypanosoma congolense* and *T. vivax* in Cattle. *Brit. J. Pharmacol. & Chemotherapy*. 1954, Mar., v. 9, No. 1, 37-41.

BETTINOTTI, C. M. Difusión de la enfermedad de Chagas en Córdoba (R.A.) (Y distribución de casos observados en la Provincia). [Prevalence of Chagas's Disease in Córdoba; Distribution of Cases in the Province] *Semana Méd.* 1954, Jan. 28, v. 104, No. 4, 98-107, 1 map. [29 refs.] English summary.

The vast majority of vectors of *Trypanosoma cruzi* in Córdoba are *Triatoma infestans* and of 885 examined 415 (46.8 per cent.) were infected, and of 15 dogs and guineapigs taken at random from dwellings 6 were infected by *T. cruzi*. Between December 1948 and May 1953 examination of human subjects was carried out in the city and province of Córdoba by various methods: direct blood examination, fresh, by thick drop, by inoculation and by complement fixation. These methods are described in detail but need not be referred to here as they are well known to all readers of this *Bulletin*.

Of 1,241 tests carried out 291 proved positive; these were performed on 899 persons, 278 of whom were infected with *T. cruzi* (30.9 per cent.) and of the total 413 were in the city itself and 116 were positive (28.0). [In a detailed table, however, it is stated that 213 were positive out of 624 (34.1) in the whole province and 122 out of 428 (28.5) in the city itself.] Of 170 samples of blood taken at random from the general population for c.f. tests 46 were positive (27 per cent.); of 129 from the provinces 24 per cent. and of these 72 were from the city and 16.6 per cent. (13) were positive. Among patients attending hospital 263 were suspected of infection and more than one-third of these were positive (35.3 per cent.). Of persons with cardiovascular disturbance 444 were examined by c.f. and 29 per cent. were infected, the proportions from the city and the whole province being nearly the same, 27.9 and 28.2 per cent., respectively.

A list is given of 46 localities whence samples were taken, and positive human cases were found in all but one and in this infected Triatomidae were found. The precautions proposed are the same as have been given on former occasions: the use of insecticides, especially "Gammexane", to get rid of the vector, and particular care in choosing blood-donors in any endemic zone.

H. Harold Scott

DE FREITAS, J. L. P., ROCHA, U. F., VASQUEZ, J. A. Z. & AFTIMUS, T. N. Inquérito preliminar sobre a infecção pelo *Trypanosoma cruzi* (Chagas, 1909) entre cães e gatos domésticos no Município de Campo Florido (Triângulo Mineiro), Minas Gerais, Brasil. [Preliminary Enquiry regarding Trypanosoma cruzi Infection in Domestic Dogs and Cats in Campo Florido, Minas Gerais, Brazil] *Rev. Facul. de Med. Vet. São Paulo*. 1952, Dec., v. 4, No. 4, 545-51. [12 refs.] English summary.

The authors report the results of a survey for the incidence of infection with *Trypanosoma cruzi* among cats and dogs in the township of Campo

Florido in the Brazilian province of Minas Gerais. The object of this investigation was to determine the epidemiological rôle of these animals as reservoir hosts of Chagas's disease. The infection in cats and dogs was determined by xenodiagnosis, for which 5 bugs of the local "domestic" species, *Triatoma infestans*, were allowed to feed on each animal. In addition to this method—in the case of dogs only—the complement-fixation test was also applied. The results of the survey were as follows. Xenodiagnosis revealed infection in 8 (7·8 per cent.) dogs out of 102 examined, and in 12 (25·5 per cent.) cats out of 47, while the complement-fixation test was positive in 16 (11·2 per cent.) out of 143 dogs. In 57 dogs diagnosis was carried out by both methods, xenodiagnosis revealing 3 (5·26 per cent.) infected dogs and the serological test 6 (10·53 per cent.). From 68 houses in which cats and dogs were examined, in 22 at least one animal was found harbouring *T. cruzi*. Finally, among 272 *Triatoma infestans* collected in houses, 61 (22·4 per cent.) proved to be infected with this trypanosome. [No data are given for the incidence of infection among the human inhabitants of Campo Florido.]

C. A. Hoare

PÉREZ REYES, R. El origen de los tripanosomas en cultivos de *Schizotrypanum cruzi*. [Origin of Trypanosomes in Cultures of *Trypanosoma cruzi*] Rev. Inst. Salubridad y Enfermedades Trop. Mexico. 1953 June, v. 13, No. 2, 101-9, 46 figs. on pl. [18 refs.] English summary (8 lines).

The author describes the development in culture of 3 Mexican strains of *Trypanosoma cruzi* isolated from infected bugs, *Triatoma phylllosoma pallidipennis*. According to these observations the metacyclic trypanosomes arise in cultures grown on the medium of TOBIE, VON BRAND and MEHLMAN [this *Bulletin*, 1950, v. 47, 604], in 2 ways: those appearing by the 12th day are derived from crithidial forms by migration backwards of the kinetoplast, while those found by the 4th week are said to originate from small leishmanial forms by "unrolling" of the body, as described by ELKELES [this *Bulletin*, 1945, v. 42, 872; 1952, v. 49, 126].

C. A. Hoare

WOOD, S. F. Survival Time of Metacyclic *Trypanosoma cruzi* in Human Sweat. [Research Notes.] J. Parasitology. 1953, Oct., v. 39, No. 5, 569-70.

Since in California *Triatoma protracta* invade human dwellings from June to September, when high temperatures persist through the night, it is conceivable that the infected droppings of the bugs contaminating human skin during that season might come in contact with sweat. In view of this possibility, experiments were carried out on the effect of human sweat on the metacyclic forms of *Trypanosoma cruzi*, with the following results: (a) in a control group, comprising fresh preparations made of equal parts of the faeces of infected bugs and sodium citrate solution, the average survival time of the metacyclic trypanosomes was 76·7 minutes (range 20-157 minutes); (b) in the experimental group of preparations citrated trypanosomes were mixed with equal amounts of human sweat: in this case the average survival time was 17·1 minutes (range 10-33 minutes). All the observations were made at room temperatures (32-34°C.). It is concluded that the infective forms of *T. cruzi* are immobilized by sweat.

C. A. Hoare

PELLEGRINO, J. & BRENER, Z. A reação de fixação do complemento com antígeno de formas de cultura do *Schizotrypanum cruzi* na leishmaniose tegumentar americana. [The Complement-Fixation Test with *T. cruzi* Antigen in Patients with Cutaneous Leishmaniasis] Hospital. Rio de Janeiro. 1952, Dec., v. 42, No. 6, 971-80. [24 refs.] English summary.

In view of the co-existence, in many parts of Brazil, of Chagas's disease and cutaneous leishmaniasis, it is important in cases of leishmanial infection to exclude the possibility of a concomitant infection with *Trypanosoma cruzi*. With this object in view, observations were made to determine the specificity of the reaction in complement-fixation tests with Davis's antigen prepared with the cultural forms of this trypanosome. The test was carried out in 37 patients suffering from leishmaniasis, 10 of whom came from endemic areas of Chagas's disease. In 6 of the latter cases the reaction was positive, whereas in 27 patients it was negative. From these data it is concluded that the test with Davis's antigen is sufficiently specific for the differential diagnosis of Chagas's disease, as well as for the determination of its incidence in survey work.

C. A. Hoare

RODRIGUEZ M., J. D. Inmunidad en la tripanosomiasis Americana. Presencia de "Inmovilismos". [Immunity in American Trypanosomiasis: Presence of Immobilizing Antibodies] Rev. Ecuatoriana de Hig. y Med. Trop. Guayaquil. 1952, Jan.-Dec., v. 8/9, Nos. 1/4, 107-12.

The demonstration by NELSON and MAYER [see *Bulletin of Hygiene*, 1949, v. 24, 646] of the presence in syphilitic sera of a specific antibody which immobilizes *Treponema pallidum* has prompted the author to investigate the possible existence of comparable antibodies in Chagas's disease.

For these tests, the sera were taken from infected and normal rats, from normal human beings and those showing a positive Machado's reaction, as well as from cases of Chagas's disease. The inactivated sera were tested at 10°C. against saline suspensions of 5-6-day NNN cultures of *Trypanosoma cruzi*, containing 5-8 organisms per microscopical field, in the presence of complement provided by addition to the preparation of various amounts of 1: 10 dilution of guineapig serum.

The set-up of the tests, with the amounts of the reagents used, and the results—expressed in percentage of immobilized trypanosomes—are given in 4 tables. From these it is seen that the sera of infected animals inhibit the movements of the flagellates. The phenomenon of immobilization is a specific reaction, which is manifested only in the presence of adequate amounts of complement, its effect being to produce the initial stages of trypanolysis. Further experiments will show whether the new test can be applied in practice for the diagnosis of Chagas's disease.

C. A. Hoare

PÉRA, J. S. Sobre um aspecto eletrocardiográfico da cardiopatia chagásica crônica. [Electrocardiographic Aspects in Chagas's Disease] Hospital. Rio de Janeiro. 1953, Aug., v. 44, No. 2, 253-8, 5 figs.

Brief notes are given of 7 patients suffering from palpitation, dyspnoea or congestive cardiac disease, except one who made no complaint of subjective symptoms but exhibited electrocardiographic changes. They were all indicative of myocarditis with signs of anteroseptal infarct, but in none could the possibility of previous coronary thrombosis be definitely excluded,

bearing in mind the fact that 4 were between the ages of 40 and 53 years and only 3 were below 40 years, and none gave a history of any previous attack of cardiac pain. Electrocardiographic tracings are reproduced but on too small a scale to be legible.

H. Harold Scott

FAGGIN, J. E. Algumas considerações gerais sobre o estudo clínico da moléstia de Chagas. [Some General Considerations on the Clinical Study of Chagas's Disease] *Arquivos de Hig. e Saúde Pública*. S. Paulo. 1953, Mar., v. 18, No. 55, 25-31.

FAGGIN, J. E. Considerações em torno da terapêutica da moléstia de Chagas. [Observations on the Treatment of Chagas's Disease] *Folia Clin. et Biol.* S. Paulo. 1952, Dec., v. 18, No. 3, 143-55. [42 refs.] English summary (7 lines).

WOOD, S. F. Hematologic Differentiation of the Intramuscular Developmental Forms of *Trypanosoma cruzi* Chagas. *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1015-35, 19 figs. on pl. [50 refs.]

The author gives a detailed account of the intramuscular life-cycle of *Trypanosoma cruzi* in mice. The infections were produced by inoculation of saline suspensions of the faeces of infected *Triatoma protracta* into the gastrocnemius muscles. The animals were killed at various intervals, and the trypanosomes were studied in tissue-impression (or "tissue-contact") preparations of the muscles and blood, dry-fixed and stained by Jenner-Giemsa's method. For the differentiation of the stages of development the author has employed such cytological criteria as basophilia of the cytoplasm, its vacuolization and volutin inclusions, using a haematological nomenclature for their description.

The development of *T. cruzi* in the muscle is said to proceed as follows. The slender metacyclic trypanosome becomes broader and thicker, assuming a crescentic shape; it gradually loses the trypanosome structure and becomes rounded; the flagellum shortens and the parasite assumes a rounded leishmanial form which retains a short flagellum. This phase of development, which is termed "regressive", is characterized by decrease of acidophilia, increase of basophilia, volutinization and vacuolization of the cytoplasm. The leishmanial forms multiply by binary fission, the daughter-individuals elongate and develop a long flagellum, initiating the "progressive" development terminating in the production of trypanosome forms. These are said to arise in two ways: either by "unrolling" of the rounded body (which is more common), or by its gradual elongation [see this *Bulletin*, 1951, v. 48, 793].

In the "progressive" stages the flagellates show decreased basophilia, increased acidophilia, decrease of volutin and disappearance of vacuoles. The trypanosomes formed in this manner are of the mature blood stage, which is dimorphic, being represented by short slender forms originating from small leishmanial forms, and by long slender forms derived from large leishmanial forms. The blood forms are then transformed into more thick-set "regressive" trypanosomes which invade the muscles and repeat the pattern of development initiated by the metacyclic trypanosomes.

The findings of the author are compared with observations of some previous authors, which are critically discussed. [In this connexion it should be noted that no reference is made to the important paper of GALLIARD (this *Bulletin*, 1953, v. 50, 19), whose observations and interpretation of the life-cycle of *T. cruzi* in the vertebrate host differ significantly

from those of Wood. Further, it is surprising that the last-named author failed to find the well established leptomonad stage in the development of *T. cruzi*, and does not refer to the characteristic leishmanial forms in which no vestige of a flagellum is visible.] The paper is accompanied by a plate of figures, illustrating the whole life-cycle of *T. cruzi*. C. A. Hoare

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

MITRA, R. D. Bemerkungen über Sandfliegen (Phlebotomen). Über die geographische Verbreitung des Genus *Phlebotomus* im Staat Bombay, Indien. [Geographical Distribution of *Phlebotomus* in Bombay State] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 109–13, 1 fig.

The English summary appended to the paper is as follows:—

“In the State of Bombay, India, the following 8 species of *Phlebotomus* have been recorded from 64 places situated on the plains, hills and sea coast: *P. argentipes*, *P. papatasii*, *P. squamipleuris*, *P. minutus*, *P. colabaensis*, *P. smithi*, *P. thapari* and *P. chakravarti*.”

WENG, Hsin-chih, CHUNG, Huei-lan, HOU, Tsung-ch'ang & HO, Lien-yin. A Simplified Antigen for Kala-Azar Complement Fixation Test with Observations in 742 Cases. *Chinese Med. J.* Peking. 1953, Sept.–Oct., v. 71, No. 5, 328–33.

The antigen was made from the spleen of an infected hamster *Citellus dauricus*, heavily loaded with leishmaniae. This was minced and then ground to a fine paste in a sterile mortar. The paste was spread over a clean glass plate. The plate was dried in a closed glass chamber with the aid of a fan. The dried powder was scraped off, pulverized and stored in the dry state. The dried antigen can be kept satisfactorily at –9°C. in a refrigerator up to 16 months, but its antigenic titre falls slowly so that it is necessary to test it from time to time. The powder is extracted by the adding of 20 mgm. to 1 ml. of normal saline; the mixture is left overnight in the refrigerator. The supernatant fluid is used as antigen in a complement-fixation test by a standard Wassermann technique.

In the Central People's Hospital, Peking, 485 sera were tested together with 257 sera from other hospitals. Of the total of 742 sera, the result was right in 687 (92·6 per cent.) and wrong in 22 (3 per cent.); in the rest it was doubtful or anticomplementary. In 7 cases there was a false positive result; of these 3 patients had malaria, 2 Banti's syndrome, 1 cirrhosis and 1 fever of undetermined cause. In the febrile cases, the complement-fixation test was positive only during the fever. The bone-marrow and splenic material showed no leishmaniae in any of these cases. In the 15 false negative cases leishmaniae were found in the bone-marrow. Of the 24 anticomplementary cases 8 were diagnosed kala azar; in all these the complement-fixation test became positive during or after treatment.

If the doubtful or anticomplementary cases are excluded the percentage of correct results is 97.5.

In a series of 46 cases of Banti's disease the test was positive in only one; this disease should not therefore normally lead to confusion.

This test then exhibits a high degree of specificity but the authors consider that the "final diagnosis of kala-azar should always be decided by the finding of *Leishmania donovani*".

L. E. Napier

FAILOLO, A. & CAPORALETTI, I. Contributo alla cura della leishmaniosi viscerale con antimoniato di N-metil-glucamina. [The Treatment of Visceral Leishmaniasis with N-methyl-glucamine Antimoniate] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Dec., v. 34, No. 12, 645-53. [10 refs.] English summary.

The authors report on their clinical and laboratory findings in 4 cases of visceral leishmaniasis which they have treated with N-methyl-glucamine antimoniate (2,168 RP or Glucantime as produced by Messrs. Farmitalia).

The authors claim to have obtained recovery, free of relapses, in all 4 cases. They have given each patient 2 courses of 12-15 days, each separated by a 10-days' rest, in somewhat lower doses than that usually recommended. [The abstracter finds some difficulty in correlating the doses with the age and body weight of each patient as given in this paper.] The enlargement of the liver was the last sign to subside under the treatment and the authors believe this to be due to fibrotic changes which had already become established; in one case they also administered adrenaline, on the Ascoli principle. This form of antimony seemed well tolerated on the whole, any signs of intolerance appearing most frequently in respiratory form.

J. Cauchi

GRAMICCIÀ, G. & SACCÀ, G. Notes on Kala-Azar and its Control in Iswarganj Thana, Mymensingh District, East Bengal. *Indian J. Malariology*. 1953, Mar., v. 7, No. 1, 83-91, 1 map.

A unit working under the auspices of WHO in Mymensingh, East Bengal, on an antimalaria scheme undertook as a sideline an enquiry into the effect of their work, DDT residual spraying, on the incidence of kala azar.

The scheme of work consisted of (a) a preliminary survey of a definite area; children under the age of 15 years were examined and sandflies were collected; (b) DDT spraying of part of the area; (c) a follow-up survey of children and continued collection of sandflies. The diagnosis was made by the aldehyde test with a modified technique, in conjunction with the size of the spleen.

The first survey was carried out between January and July 1950. Altogether 6,108 children were examined; of these 2,718 (44.5 per cent.) had enlarged spleens and 510 (8.35 per cent.) were diagnosed as having kala azar. In 61 of 149 families there was more than one case. Of 123 patients with kala azar 10 (8.1 per cent.) had malaria [that is, presumably, malaria parasites in the peripheral blood]. The authors point out that this shows that there is no incompatibility between the 2 infections in one person. [Conversely, if such incompatibility exists, and there is some evidence that it does, it might be argued that the diagnosis of kala azar, which was not parasitological, was too readily made.]

A second survey was made between October 1950 and January 1951. A total of 3,052 children that had been negative at the first examination were

traced and re-examined. Of these 899 lived in the area sprayed in June 1949; all were still negative for kala azar except one and he had lived for 2 months in the unsprayed area. In the area that had not been sprayed in May-June 1950, 2,153 were retested and 40 were found positive. This suggested that infection had occurred since June 1949 in the latter area.

The sandfly survey in the unsprayed area produced sandflies each month with the largest catches in March, April and May. In the sprayed area sandflies were caught in only one hut, and this hut had largely been rebuilt since the spraying.

Of 134 sandflies examined (at a later date, in Rome) only one (male) *Phlebotomus argentipes* was identified. The others were *Phlebotomus (Prophlebotomus) squamipleurus* (42), *P. (P.) africanus* (60), and *P. (P.) shortti* (31). The authors point out the interesting fact that only one specimen of a recognized vector species of *Phlebotomus* was found. They make no greater claim than that their observations suggested that the transmission of kala azar was materially reduced by the DDT spraying; no details of this procedure were given in their paper.

L. E. Napier

CHU, T. S. **Leishmaniasis with Unusual Mucocutaneous Manifestations.**
A Clinical Case Report. *Chinese Med. J.* Peking. 1953, Sept.-Oct.,
v. 71, No. 5, 354-8, 5 figs. on 2 pls.

A Chinese who had always lived in Tientsin had a febrile attack lasting about 20 days. Shortly afterwards he developed a purplish-red plaque on his forearm "the size of a coin". [It is not stated whether this persisted or disappeared.] About 23 years later, he developed rosaceous patches on the face; these extended and gradually developed into small tumours, so that when he was seen 7 years later the "entire head was covered with purple red, soft, elastic, smooth, shiny, semiglobular tumors varying from pea to walnut in size, firmly embedded in the skin and closely set together. . . . The tumor masses were hanging from the chin like bunches of grapes and from the earlobes like pendula. The eyebrows and scalp hair were scarce. The four extremities, trunk, prepuce and perianal region were less extensively involved. The palms, soles and skin folds were not affected.

"The tongue and the palate showed several purple red, circumscribed, slightly raised plaques, and so did the conjunctivae". The mucous membranes of the nasopharynx, larynx (except vocal cords), bronchi and oesophagus were infiltrated and showed flattened nodular elevations; there also appeared to be a few plaques in the rectal mucosa.

There was no evidence of visceral infection.

A histological section of a nodule showed a thinned epidermis with a dense cellular infiltration of the dermis. "This infiltration is composed of cells of various kinds, chiefly lymphocytes, reticulum cells, fibroblasts and some plasma cells. The infiltrated area is fairly vascular, considerable numbers of small vessels of capillary character being present. Hair follicles and sweat glands are not observed to suffer any degenerative or destructive change. Innumerable small oval organisms, morphologically indistinguishable from Leishman-Donovan bodies, are present in abundance in the cytoplasm of mononuclear cells, though by no means exclusively confined to them."

Neostibosan was given in doses of 0.3 gm. on alternate days up to a total of 4.7 gm. Three months after commencement of treatment all the tumours showed "some degree of diminution" and leishmaniae were now scanty. [The photograph shows a mass resembling a shelled walnut in

which it is difficult to recognize a human face. Several similar cases of extensive and disfiguring post-kala-azar dermal leishmaniasis have been encountered in India, but even there they are comparatively rare.]

L. E. Napier

CICCHINI, T. & CORPORANDI, G. Studio statistico-epidemiologico sulla leishmaniosi cutanea nella Provincia di Teramo. [A Statistical and Epidemiological Study of Cutaneous Leishmaniasis in the Province of Teramo] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Dec., v. 34, No. 12, 665-74. [11 refs.] English summary (4 lines).

Teramo abuts on the Adriatic Sea, in Central Italy. It is mountainous along its west side and has a strip of flat coastal plain on the east. The rest is moderately hilly. Several rivers flow along the valleys which run in a west-east direction.

The authors have looked into the records of a total of 911 cases of cutaneous leishmaniasis notified to the Public Health Department in July 1949-June 1953, and have studied, in some more detail, 57 cases from 4 districts which have been treated with DDT since 1948, when an incidence rate of 2·9 per cent. was found among 28,599 persons examined in 2 of these districts. This rate has fallen to 0·7 per cent. in 1949 and 0·13 per cent. in 1950, compared with an incidence rate of 4·04 per cent. in an untreated zone studied as a control. The authors have also looked into the records of the Provincial Public Health Laboratory and the Treatment Clinic.

Leishmaniasis of the skin accounts for 17 per cent. of notifications of infectious disease in this province. Generally speaking, the authors' findings have confirmed the impression that the disease tends to be more prevalent along the river valleys and less prevalent at the higher altitudes.

Phlebotomus perfiliewi is found in this province, as well as *P. perniciosus* and *P. papatasi*. The first-named species has been found to bite man, cattle and horses in that order. Both the visceral and the skin forms of the infection have been demonstrated in the local dogs and *Leishmania* infection has been reported in one sheep.

Only minor differences in prevalence have been found by age, sex or season.

J. Cauchi

COLAS-BELCOUR, J. & VERVENT, G. Les caractères de la culture en voile de *Leishmania tropica* Wright 1903 sur milieu liquide, n'ont pas une valeur spécifique mais varient suivant les souches. [The Characters of Films appearing in Cultures of *Leishmania tropica* in a Fluid Medium have no Specific Value but vary according to Strains] *Arch. Inst. Pasteur du Maroc.* 1953, v. 4, No. 6, 389-404, 5 figs. (4 on pl.). [22 refs.]

Since *Leishmania tropica* shows a tendency to form surface films when grown in liquid media (*culture en voile*), this peculiarity has been used by some authors for the differentiation of this species from *L. donovani*. To test the validity of this view, the present authors have compared the cultivation of 7 strains of *L. tropica* (Iranian, Palestinian, 2 Greek, 2 American, and Tunisian) in broth, to which 4-16 drops of defibrinated rabbit blood was added. Optimum growth was at 22-23°C.

It was found that, from the point of view of the formation by the flagellates of surface films in cultures, the 7 strains behaved in different ways: while some failed to produce such films at all, others produced them after the expiration of variable periods of time, from 3 to 39 days. The

method of development of the flagellates in these films, though variable, was constant for a given strain. In some its initial growth was rapid; it lasted for a moderate time, and decreased slowly. In others the initial growth was slow, reaching a low density and declining slowly. In others again, the initial growth was very rapid, but it persisted for a very short time, and disappeared abruptly. In the early stages of film-formation the flagellates produce multiple rosette forms, adhering to one another and multiplying intensely by binary fission. Later on, to these are added masses of multinucleate plasmodial giant forms of leptomonads. In the later stages, the giant forms gradually disappear and dividing forms become scanty. By this time degenerating flagellates are gradually increasing in numbers, until the reduced surface film is composed chiefly of empty "shells" of leishmaniae.

It is concluded that the formation of surface films by the flagellates in culture does not represent a specific character of *L. tropica*, differentiating it from related species, but varies with different strains of this species itself.

C. A. Hoare

ANSARI, N. & FAGHIH, M. Leishmaniose cutanée à *L. tropica* chez *Rhombomys opimus*. [Cutaneous Leishmaniasis in Gerbils, *Rhombomys opimus*] Ann. Parasit. Humaine et Comparée. 1953, v. 28, No. 4, 241-6, 2 figs.

After having recorded in 1949 the presence of the "moist" form of cutaneous leishmaniasis in North-Eastern Iran [this Bulletin, 1951, v. 48, 972] the authors carried out a further survey of this region in 1951. In the desert area of Sarakhs, bordering on Soviet Middle Asia, they examined 35 persons, among whom 18 were found to have typical lesions of the "moist" form of oriental sore. They next turned to the province of Gorgan, where the incidence of infection among soldiers approached 90 per cent. in 1949, but this time only a single case was detected. The disappearance of human infection is attributed to the successful application of DDT against sandflies. A survey was then carried out of various desert rodents along the river Atrak, separating this part of Iran from the U.S.S.R. These rodents included *Allactaga elater*, *Allactagulus pygmaeus turcomanus*, *Meriones (Pallasiomys) erythrourus* and *Rhombomys opimus*. Of these species only the last-named gerbils proved to be infected, 12 out of 75 (16 per cent.) showing typical lesions of cutaneous leishmaniasis on their ears, in 8 of which *Leishmania tropica* was demonstrated directly and in NNN culture. In 4 of these animals the infection persisted after 16 months of captivity.

A culture of the gerbil strain of *L. tropica* was inoculated intradermally into 3 human beings, of whom one had not previously been infected, and the 2 others bore scars of healed sores of the "dry" type. After an incubation period of 25 days, the first person developed a typical sore of the "moist" type, which persisted—up to the time of complete cicatrization—for 2½ months. The 2 other men showed only an allergic reaction manifested by the appearance at the site of inoculation of an erythematous papule, with oedema, accompanied by shivering, high temperature, and headache. While the general symptoms disappeared after 48 hours, the swelling lasted about 30 days. [Though this is not stated, it is evident that the last 2 cases were refractory to infection.] It is concluded that naturally infected gerbils can serve as reservoir hosts of human oriental sore of the "moist" type.

C. A. Hoare

BIAGI F., F. La leishmaniasis tegumentaria mexicana y algunos datos médico—Estadísticos de Escárcega, Camp. [Cutaneous Leishmaniasis and Other Medical Data in Escárcega (Mexico)] [Thesis] 119 pp., 26 figs. [106 refs.] 1953. Mexico.

Escárcega is situated in the Carmen district of Campeche State. This thesis, as regards the clinical aspect of cutaneous leishmaniasis, contains little that is not known to readers of this *Bulletin*; the only part that is new to them will be the local application of the facts and some account of diseases other than that specifically named in the title.

The thesis is divided into 2 main parts, preceded by preliminary statements on the geographical situation of Escárcega and vital statistics of the population and their occupations. This preliminary section tells that the district is the centre of chicle trees and the chief occupation is the gathering of chicle gum, the basis of American chewing-gum. The climate is moist, never below 80 per cent. relative humidity, and the average temperature 27°C. There is only one river of any size, the Candelaria. The rainy season, when the rainfall is abundant, is from May to November; between December and April the rainfall is scarce. The area is well wooded. According to the 1950 census the population was 2,617, of whom 794 were adult males, 706 were women, 605 were schoolchildren and 512 of pre-school age. The present estimated population is 3,000; the density in general is low, 0.3 per sq. km.; one-third live in Escárcega and two-thirds in small conglomerations or camps along the communication routes or in ranches. The total population is, however, liable to large variations, at times there have been as many as 10,800 working at collection of chicle gum; at other times only 2,800; in 1950 there were 6,921 so employed. The gum is collected in the rainy season. An "encampment" usually comprises 10 to 15 men, 2 or 3 women, and they stay for 2 to 5 months at a time. Occupations other than the chicle gum industry are forestry and the cultivation of maize.

After these preliminary statements comes the thesis proper, divided, as stated above, into 2 parts. The first is concerned with medical statistics, morbidity and mortality rates and remarks on the prevailing diseases; Part II deals with the avowed subject of the thesis, cutaneous leishmaniasis.

Data for Part I are taken from the official registers for the 4 years 1947 to 1950 and the calculations are based on a population of 2,500. The general mortality rate is 20 per mille; stillbirths were 32.7 per 1,000 live births and infant mortality (deaths in the first year) 241 per mille; maternal mortality was only 0.7, a low figure considering how bad are the conditions and attendance at parturition. The main causes of death, as registered, per 100,000 inhabitants are: diarrhoea 370, malaria 360, accidents and injuries (sustained in quarrels, *riñas*) 160, bronchopneumonia 110, whooping-cough 90, malnutrition (*carenceas*) 70; under the heading "other infections" but not specified, 160; and 460 are entered as dying unattended medically and 220 under the nondescript heading "various". Expectation of life is not very hopeful; at birth it is said to be 16 years; after the first year 24 years, at 11 years of age 42 years, and at 36 years of age expectation is to reach 58.

Diseases are listed under the following groupings: *digestive* 284, including parasitosis, diarrhoea, malnutrition, hernia, pellagra and others; *cutaneous* (172), including leishmaniasis and scabies as the commonest, impetigo, mycosis and others a long way behind; *respiratory* (127) mostly influenza (50) with bronchitis and tuberculosis next; for some reason not very obvious dengue is entered in this group; *general* including malaria, syphilis, typhoid

and other fevers. Other groups are obstetric, genitourinary, nervous, locomotor, sense-organs, cardio-vascular and endocrine—a peculiar grouping.

Among 45 cases of *malaria*, *P. vivax* was found in 6, *P. falciparum* in 12; *P. malariae* was not seen, nor is anything said of the other 27 cases. The chief local vectors are *A. albimanus* and *A. pseudopunctipennis*. *Tuberculosis* accounts for "the highest coefficient of morbidity", 800 annually per 100,000. Positive intradermo-reactions to tuberculin were given in 37·3 per cent.; among adults alone 66·6 per cent. and rather more among females. Of *intestinal parasites*, *E. histolytica* was seen in 27·3 per cent. among 194 specimens examined and commonest among schoolchildren, but during 10 months the author saw only 3 cases of amoebic dysentery. *Giardia intestinalis* was present in 24 per cent. of pre-schoolchildren, often associated with infant diarrhoea. Hookworm infection was present in 75 per cent. of the schoolchildren. *Syphilis* was not common; of 133 Kahn tests carried out only 6·8 per cent. were positive.

So much for Part I. Part II starts with a definition of muco-cutaneous leishmaniasis, popularly known as "chicle ulcer" or "prick of the chicle fly", and first reported by SEIDELIN [this *Bulletin*, 1912, v. 1, 13]. Next follows a list of the places in which the disease is known to occur and a line map indicating areas in which it has been proved and larger districts where it is suspected to occur. Between 1946 and 1951 there was an annual average of 35 cases recorded and many give a history of having had the infection for 6 years and some for as long as 13 to 15 years; 90 per cent. start at the time of the rains. The youngest patient was a boy of 7 years (children rarely visit the chicle camps), but 43·3 per cent. of the patients were in their second decade, another 34·4 per cent. in their third, 16·4 in the fourth; only 6 per cent. were over 40 years of age. Few women work in the woods and men constitute 91 to 95 per cent. of cases, according to the records. Of those infected, 12·5 per cent. were infected within 2 years of starting work, 50 per cent. within 5 years, 75 per cent. within 15 years and all within 30 years.

The author discusses several insects as possible vectors—fleas, bugs, ticks, Triatomidae—but the commonest species in the endemic zone to bite man is *Phlebotomus*, *P. cruciatus*, *P. panamensis* and *P. shannoni*, and these abound towards evening at the time of the rains.

Next comes a clinical section and by far the commonest site of infection is the ear, the primary lesion being an erythematous papule, of 5–10 mm. diameter, which starts to ulcerate in 5 to 15 days. A nodular dermic form is much less often seen and is slower to evolve. The thesis contains a series of photographs showing different stages of the lesions from the commencing ulcer to the extensive necrosis and cicatrizing mutilation of the ear. Prognosis is good if proper treatment is taken in hand early. Strange to say, lesions in other parts of the body than the ear tend to spontaneous cure in a few months. Diagnosis is easy by direct parasitscopy of the more recent lesions, but is often negative in the later stages. The Montenegro intradermal reaction is positive in 70 per cent. of cases within 2 months and in 100 per cent. of those of 6 months' duration. Attempts at culture in NNN medium have, in the author's hands, always failed.

As regards treatment the author mentions the popular remedies by caustics and irritants, merely to show that they are not only ineffectual but harmful. In fact, local treatment, except keeping the ulcer clean and protected, is of no avail. Specific treatment is by antimony in some form: tartar emetic, neostibosan, Fuadin, Repodral, Glucantime and Lomidine have all been favourably reported upon, but the first has proved quite successful in Mexican cutaneous leishmaniasis and there has been no need

to resort to the others. Prophylaxis is hardly a practical proposition. DDT may be used in the huts; antileishmania vaccination is mentioned as possible, but not feasible; eradication of the transmitting insect would only be possible by cutting down the whole forest which, says the author, "would not be economical". [It certainly would be like the Chinese idea of setting the house on fire to roast the pig.]

The thesis concludes with a description of the technique of taking specimens from the edge of the lesions (not the ulcerated part) and details of the Montenegro reaction, of the capture and dissection of the *Phlebotomus*, rearing the insect in the laboratory and the mounting of specimens.

H. Harold Scott

See also p. 551, PELLEGRINO & BRENER, A reação de fixação do complemento com antígeno de formas de cultura do *Schizotrypanum cruzi* na leishmaniose tegumentar americana [The Complement-Fixation Test with *T. cruzi* Antigen in Patients with Cutaneous Leishmaniasis].

DE ALMEIDA, M. A. Sobre a localização das lesões secundárias da leishmaniose tegumentar americana. (Nota prévia.) [On the Localization of Secondary Lesions in American Cutaneous Leishmaniasis] *Brasil-Médico*. 1953, June 6 & 13, v. 67, Nos. 23/24, 415-19. English summary.

The primary lesion, being due to the bite of *Phlebotomus*, occurs on some exposed part of the body. Secondary lesions occur widely distributed over the body. It has been held by some that the distribution of the sites of these lesions is due to transference by the hands of the patient himself; by others to spread by lymphatics; by others, again, to spread by way of the bloodstream.

The author has examined 497 cases of these secondary lesions and found that the nose was affected in 158 (31.7 per cent.), the pharynx next in 46 (9.2), knees and legs in 41 (8.2), then, in order, ankles and feet, face, mouth, larynx, elbows and forearm (20 or 4.0 per cent.); other sites less often. Leptomonad forms of the parasite grow best at 20-28°C., are killed at once at 45° and in 15-20 minutes at 40°C. Similarly, high fever, as in enteric fever, will kill the parasite, whereas low temperatures are favourable to it.

Studying these facts the author comes to the conclusion that the sites of these secondary lesions are those of lower temperature and that this fact is sufficient to account for the localizations. He hopes to carry out further research to confirm his view.

H. Harold Scott

PARAENSE, W. L. The Spread of *Leishmania enriettii* through the Body of the Guineapig. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 556-60, 32 figs. on 5 pls.

The manner in which the parasites in cutaneous leishmaniasis spread from the site of inoculation to other parts of the skin is still a matter of controversy. In order to throw light on this problem, the author has carried out experiments with *Leishmania enriettii*, the causative agent of cutaneous leishmaniasis in guineapigs of South America [this *Bulletin*, 1948, v. 45, 776]. A suspension of parasitized tissue was inoculated intradermally into the ears of 20 guineapigs, which were then killed at intervals from 5 to 362 days after inoculation, when fresh tissues and organs were fixed, embedded and sectioned.

In the experimental animals metastatic lesions were found (clinically or histologically or both) in the feet, nose, nasal mucosa, scrotum and eyelid. From the histological examination of stained sections (described in detail and illustrated by numerous photomicrographs) it is concluded that the parasites are carried by the lymph stream from the localized lesion at the site of inoculation to a lymph node of the parotid group, where they are held up and destroyed. Metastases in the feet are produced by parasites conveyed to the extremities in the blood stream. Here they may invade the bone-marrow, producing heavy infection of this tissue exclusively. In metastatic foci drainage of the parasites into lymph nodes continues, the nodes showing signs of hyperplasia and containing parasites before the lesion becomes clinically recognizable. In one animal there was evidence of metastatic involvement of the nasal mucosa.

C. A. Hoare

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

EVERRITT, Martha G., BHATT, P. N. & FOX, J. P. Infection of Man with Avirulent Rickettsiae of Epidemic Typhus (Strain E). Amer. J. Hyg. 1954, Jan., v. 59, No. 1, 60-73. [15 refs.]

The authors describe interesting experiments with the remarkable avirulent strain "E" of *Rickettsia prowazekii* discovered in 1943 by CLAVERO and GALLARDO, who in the following year reported its suitability for use as a live vaccine against typhus fever in man [see this *Bulletin*, 1944, v. 41, 24; 1945, v. 42, 794].

In the present experiments 29 human volunteers were inoculated by various routes with different doses of living cultures of the strain which had already been passed 265 times through yolk sacs of chicks. The doses ranged from 1.5 to 7 log. egg infecting doses (EID). The 8 volunteers who received 3.5 or fewer log. EID appeared to escape infection. Most of the reactions, local and general, were of the same kind as occurred in persons inoculated with corresponding doses of killed *R. prowazekii* and therefore were regarded as being caused by the toxins contained in the inoculum. In all the cases inoculated by the intradermal and subcutaneous routes there were local reactions, often associated with lymphangitis and lymphadenitis. Slight early febrile reactions occurred on the 1st to the 3rd days in 11 cases; later febrile reactions occurred on the 10th to the 14th days in 3 cases and on the 17th to the 21st days in 3 other cases. The late reactions may have been associated with the multiplication of the rickettsiae in the body but although repeated attempts were made it was not possible to recover the organisms by egg culture or animal inoculation from the blood of any of the volunteers.

All the 21 volunteers who received 4.5 or more log. EID gave rising-titre responses to the complement-fixation test but none of the 8 who received smaller doses gave any response. The positive reactions reached the maximum titres, ranging from 1 in 8 to 1 in 64, about the 30th day in most

cases and then gradually declined. The results of mouse toxin-neutralizing tests corresponded with those of the complement-fixation tests.

The results were not regarded as justifying a recommendation for the adoption of this living vaccine but they provided no evidence of its being risky or ineffective.

John W. D. Megaw

Fox, J. P., EVERITT, Martha G., ROBINSON, T. A. & CONWELL, D. P.
Immunization of Man against Epidemic Typhus by Infection with Avirulent *Rickettsia prowazekii* (Strain E). Observations as to Post-Vaccination Reactions, the Relation of Serologic Response to Size and Route of Infecting Dose, and the Resistance to Challenge with Virulent Typhus Strains. Amer. J. Hyg. 1954, Jan., v. 59, No. 1, 74-88.
[15 refs.]

Details are given of the results of inoculation of 125 healthy volunteers with various doses of the same strain E of living *R. prowazekii* as is referred to in the previous paper; 50 comparable volunteers served as controls for various purposes. The doses were 4-7 log. egg infecting doses (EID). The complement-fixation and mouse-neutralization tests showed that 6 or more log. EID gave more consistent results than did smaller doses which in 4 of the 57 persons receiving them failed to give rise to the production of complement-fixing antibodies. The production of antibodies was greater and more uniform among the persons inoculated with single doses of the live vaccine than among controls inoculated with the usual doses of the Cox type of killed vaccine. During the year following inoculation there was a pronounced reduction in the complement-fixing antibodies and to a lesser degree in the neutralizing antibodies though the latter were still easily demonstrable in 59 out of the 60 persons whose complement-fixing antibodies had disappeared at the end of a year. Challenge inoculations with virulent *R. prowazekii* cultures were given at various intervals to 3 groups of volunteers, each of which consisted of 6 persons who had been immunized with the living vaccine and of 2 healthy controls. One of the 6 members of the group challenged 2 months after inoculation had a slight febrile reaction on the 13th and 14th days; in the 2 other groups of immunized persons, who were challenged after $7\frac{1}{2}$ and 12 months respectively, no fever occurred. The only other clinical reaction among the immunized was the occurrence of a transient small papule at the site of inoculation, which was by the intradermal route. All the 6 non-immunized controls developed typical typhus reactions after incubation periods of 6 to 12 days; they were treated with aureomycin after 48 hours of fever and responded within 24 to 72 hours; the dosage was 3 to 5 gm. daily for 7 days.

The challenge doses were followed by a significant rising-titre reaction in only one of the immunized persons, and he was the one who had a febrile reaction after the challenge dose.

There was, therefore, evidence that a suitable dose of the vaccine had produced immunity lasting at least a year, but this was "certainly inferior in degree and probably in duration to that which follows naturally acquired infection with unmodified *R. prowazekii*".

The authors discuss the relative merits of immunization with the E strain as compared with the Cox type of vaccine but conclude that the former, though probably significantly superior, cannot confidently be recommended for general adoption till it has been tested on a large scale in field conditions. Such a test is being projected and further observations will be made on the volunteers already immunized.

John W. D. Megaw

AIKAWA, J. K. & HARRELL, G. T. Isotopic Studies of Fluid and Electrolyte Changes in Domestic Rabbits with Rocky Mountain Spotted Fever. *J. Infect. Dis.* 1953, Nov.-Dec., v. 93, No. 3, 222-5.

By the use of isotopic sodium ^{24}Na and potassium ^{42}K the authors have studied fluid and electrolyte changes in rabbits infected with Rocky Mountain spotted fever. Yolk sacs infected with *Rickettsia rickettsi* were used to inoculate guineapigs and from the latter an emulsion of whole blood and spleen was used to infect a total of 15 rabbits by the intraperitoneal route. They were divided into 2 groups, one of which received the sodium and the other the potassium isotope. Serum sodium and potassium determinations were made by means of a flame spectrophotometer. Before blood infection, plasma volume, the haematocrit, 30-minute thiocyanate and 60-minute radiosodium spaces were determined (see AIKAWA, *Amer. J. Physiol.*, 1950, v. 162, 695) and also the serum sodium, potassium and protein levels at 7-day intervals. Eleven days later the animals were inoculated with rickettsiae.

Daily temperature records were kept and fluid volumes were determined at intervals of 7, 13, and 20 days after infection in one group, and of 7 and 13 days in another. The blood and plasma volumes, thiocyanate and radiosodium spaces were calculated in ml. per kgm. of weight, the pre-inoculation values being used for each animal as its own control. Although guineapigs generally die of the infection, a mild disease occurred in rabbits. Statistically significant changes in fluid volumes and electrolyte concentrations were noted, and were correlated with phases in the human disease, the symptoms being the same as those found in mild cases of human Rocky Mountain spotted fever, without peripheral circulatory collapse and oedema, and in the absence of changes in serum protein. There was an increase in plasma volume and lowering of haematocrit value with little overall change in blood volume. Complement-fixation titres were raised. The thiocyanate space was increased, but the radiosodium space was not, and this anomalous finding was explained on the basis of different rates of ion exchange between extra- and intracellular phases, possibly as result of change in tissue cell membranes.

J. D. Fulton

AIKAWA, J. K. & HARRELL, G. T. Changes in the Tissue Radiosodium Space associated with Experimental Rocky Mountain Spotted Fever in Guinea Pigs. *J. Infect. Dis.* 1953, Nov.-Dec., v. 93, No. 3, 263-5.

The experiments described above by the authors in which fluid and electrolyte changes in rabbits infected with the agent of Rocky Mountain spotted fever were studied showed that the symptoms resembled those of a mild attack in man. In the present investigation guineapigs, which suffer severely, were used. Emulsions of blood or spleen of infected animals injected intraperitoneally under sterile conditions were used to maintain the strain. Alterations in the radiosodium space were determined by tissue analyses instead of by the fluid space method. A group of 12 animals was used, 6 being inoculated with *R. rickettsi* and 6 serving as controls. The techniques used for measuring the total and tissue radiosodium space were those described previously. For the latter determination heart, liver, kidney, spleen, and adrenal glands were used. Half the animals were killed on the sixth and half on the seventh day after inoculation as the peak of the illness occurs on these days.

The results indicated to the authors that the above infection in guineapigs causes a redistribution of sodium in the body, with decrease in serum

sodium and in that of the body as a whole, accompanied by disorders of kidney, adrenal and liver function, but not of heart and spleen. The use of radiosodium technique is claimed as a sensitive method of indicating physiological changes in organs and tissues.

J. D. Fulton

MAURIN, J. Recherches sur l'existence de la fièvre Q en Tunisie par la réaction de déviation du complément. [A Survey of the Incidence of Q Fever in Tunisia by the Complement-Fixation Test] *Ann. Inst. Pasteur.* 1954, Jan., v. 86, No. 1, 69-75.

The standard American antigens of *Rickettsia burneti* were employed in a serological survey of the prevalence of Q fever among goats, sheep, cattle, and human beings in Tunisia. The results of complement-fixation tests of sera from various localities in the country are shown in the table.

	Number tested	Negative	Doubtful	Weakly positive	Significant reactions	Anticomplementary
Goats	417	283	64	26	35	9
Sheep	173	87	7	8	36	35
Cattle	51	43	4	3	1	0
Man	187	152	9	10	9	7

Of the significant results in man none was strongly positive and it was not possible in any case to recover rickettsiae from human blood.

Ten attempts were made, without success, to recover the organisms from the milk of goats presumed to be infected or from suspensions of ticks collected from these animals.

The author concludes that the results do not indicate the occurrence of epidemics or even of epizootics of Q fever in Tunisia. All that can be said is that the disease occurs in this country in enzootic form.

John W. D. Megaw

CARLEY, J. G. & POPE, J. H. The Isolation of *Coxiella burnetii* from the Tick *Ixodes holocyclus* in Queensland. *Australian J. Exper. Biol. & Med. Sci.* 1953, Dec., v. 31, Pt. 6, 613-14.

Two strains of *Coxiella* [*Rickettsia*] *burnetii* were isolated from naturally infected ticks, *Ixodes holocyclus*, in August and September 1952. After 9 passages of each strain through mice, in whose spleens rickettsiae were detected, further passages were made through guineapigs which gave positive rickettsia-agglutination reactions with Q fever antigens at titres reaching 1 in 80 for each strain. In complement-fixation tests the titres were 1 in 16 and 1 in 64 respectively.

One of the infected batches of ticks consisted of 8 females collected from cows belonging to a farmer who himself had suffered from Q fever 8 months previously. Presumably there was nothing to suggest that his attack was associated with a bite by a tick. The other batch consisted of 3 unattached nymphal ticks, collected in a locality 20 miles north of Brisbane. *I. holocyclus* is the tick which most commonly attacks man in Queensland; this is the first time it has been found naturally infected, though SMITH has shown that it can be experimentally infected at all stages in the laboratory and that it can transmit infection [see this *Bulletin*, 1943, v. 40, 388]. Natural infection of this tick must be uncommon; Smith examined 220 of them, collected from bandicoots, and found them free from infection.

Among 159 other ticks of this species examined by the authors no infection was found; so also 422 ticks of 8 other species were found by them to be uninfected.

DERRICK is quoted as stating that at least 17 species of ticks in the world have been found naturally infected [*ibid.*, 1953, v. 50, 616].

John W. D. Megaw

TAKANO, K. & KITAOKA, M. **Complement Fixation in Q Fever. II. Preparation of Antigen and its Antigenicity.** *Japanese J. Med. Sci. & Biol.* 1953, Aug., v. 6, No. 4, 415-24. [24 refs.]

This is a study of the relationship between the antigens and antisera of Q fever in the light of serological tests carried out by various methods. The antigens were prepared by the Cox-Craigie method of purification of yolk-sac cultures of standard Nine Mile and Henzerling strains of the rickettsiae. The antisera were obtained from guineapigs inoculated with yolk-sac cultures of these strains.

For the complement-fixation test a modification of the WHO method was found most satisfactory. It was found that different dilutions of the antigens ranging from 1 in 10 to 1 in 160 gave almost the same maximum titres for each sample of antiserum that was tested. Both strains of antisera gave higher-titre reactions with Nine Mile antigen than with Henzerling antigen; with the former the titres of both antisera were about 1 in 320, with the latter they were about 1 in 40.

The rickettsia-agglutination test carried out by the hollow-slide technique was not satisfactory; no really significant reactions were observed. The best of the methods tested was the "equal volume adding method in test tube" read with an agglutinoscope. Both antigens were equally sensitive to a given strain of antiserum; Nine Mile antigen reacted with both antisera at 1 in 32 and Henzerling antigen reacted with both antisera at 1 in 16. No complete explanation can be offered of the special sensitiveness of the Nine Mile antigen in the complement-fixation reaction; this contrasts with the equal sensitiveness of the 2 antigens in the agglutination reaction.

John W. D. Megaw

BARTONELLOSIS

WIGAND, R., PETERS, D. & URTEAGA B., O. Neue Untersuchungen über *Bartonella bacilliformis*. 4. Mitteilung. Elektronenoptische Darstellung aus dem Blut. [New Investigations of *Bartonella bacilliformis*. Part 4. Electronoptical Appearance in the Blood] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Oct., v. 4, No. 4, 539-48, 11 figs. [15 refs.]

In continuation of their investigations on *Bartonella*-like organisms [this *Bulletin*, 1953, v. 50, 701] the authors have studied the appearance as shown by bright-field, phase-contrast, and electron microscopy of *Bartonella bacilliformis* derived from 2 cases of Oroya fever, and 2 experimentally infected monkeys. In blood films the organisms appear to lie on the surface of the erythrocytes, and are characteristically rod-shaped, 1.3 to 2.0 μ in length and 0.4 to 0.5 μ in breadth. Round or boat-shaped individuals were rarely seen, and were thought to be the result of degenerative changes.

In some electron-microscopical preparations of blood films, shadowed with osmium, a distinct membrane was visible, and, when the cytoplasm was dissolved away by the action of pepsin, the membrane remained and could be effectively demonstrated. These findings, which are illustrated by a beautiful series of photographs, indicate that *B. bacilliformis* is structurally different from the bartonellas of animals.

J. C. Broom

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

REAGAN, R. L., STEWART, Mildred T. & BRUECKNER, A. L. **Electron Micrographs of Erythrocytes from Swiss Albino Mice infected with Yellow Fever Virus (Strain 17D).** *Texas Reports on Biol. & Med.* 1953, v. 11, No. 4, 610–26, 9 figs.

This is another paper on electron microscopic studies by Reagan. Erythrocytes from Swiss Albino mice which had been infected with 17D virus were examined by the electron microscope. There are 13 full-page plates, 11 showing virus-like particles on the surface of and outside the infected mice erythrocytes, and 2 of erythrocytes of control mice which are said to show no virus-like particles. [This is a very unconvincing paper. The authors consider it justifiable to assume that any particle which is about the size of yellow fever virus represents a virus particle; the abstracter can imagine more virus particles on and near the control erythrocytes than in those from infected mice.]

G. W. A. Dick

GILLETT, J. D. & ROSS, R. W. **The Laboratory Transmission of Yellow Fever by the Mosquito *Aëdes (Stegomyia) strelitziae* Muspratt.** *Ann. Trop. Med. & Parasit.* 1953, Dec., v. 47, No. 4, 367–70.

Aëdes strelitziae, recently described from Natal, South Africa, is abundant in wooded valleys and ravines. It breeds profusely in axils of wild banana, *Strelitzia Nicolai*, and is known in company with *Aëdes simpsoni* from cultivated banana. It bites man readily. Its ability to transmit yellow fever was tested by the authors at the Virus Research Institute, Entebbe, Uganda, by feeding adults (bred from eggs sent from Natal) on a rhesus monkey inoculated intraperitoneally with yellow fever virus. The mosquitoes were fed on a recipient rhesus monkey 14–18 days after their infecting meal on the infected monkey and the recipient, as tested by sub-inoculation to mice and for neutralizing antibody, was shown to have been infected with yellow fever. Text and a table provide detailed data; virus was circulating in the recipient 2 days after the mosquitoes fed and neutralizing antibody after 10 days. Only 26 mosquitoes were available and some did not survive for the transmission test. It is emphasized that one would require to know if *Aëdes strelitziae* in nature customarily fed on some non-human host commonly circulating virus at high titre before assessing the real significance of this mosquito as a vector of yellow fever in nature.

D. S. Bertram

CANNON, D. A. & DEWHURST, F. **Vaccination by Scarification with 17D Yellow Fever Vaccine prepared at Yaba, Lagos, Nigeria.** *Ann. Trop. Med. & Parasit.* 1953, Dec., v. 47, No. 4, 381-93.

Cannon and Dewhurst have produced evidence which shows that 17D yellow fever vaccine prepared at Yaba, Lagos, in the vaccine laboratories of the Medical Department of the Nigerian Government, is an efficient immunizing agent. In two trials (Nos. 6 and 7) the vaccine was administered by inoculation and compared with a batch of vaccine manufactured by Messrs. Burroughs Wellcome & Co. (BW). The results showed that 30 of 30 students with negative pre-vaccination sera developed antibody after vaccination with BW vaccine and 53 of 55 vaccinated with Yaba vaccine. The other trials confirmed the observations of HAHN [this *Bulletin*, 1952, v. 49, 43], and DICK [*ibid.*, 1952, v. 49, 685] that scarification is an efficient route of vaccination with 17D yellow fever vaccine.

In the first trial the conversion rate (*i.e.*, the number of those with negative pre-vaccination sera whose sera became positive after vaccination) was 82 per cent. (63 of 77). In trial No. 2 the arms of those vaccinated were cleaned with ether; in No. 2 no pre-vaccination sera were available for comparison with those taken after vaccination but only 24 of 53 (45.3 per cent.) sera tested were positive after vaccination with Yaba vaccine; in another group of children vaccinated with Johannesburg vaccine 21 of 43 (48.8 per cent.) developed positive sera. In the third trial in which ether was again used to clean the arms the conversion rate was 32 of 59 (58.2 per cent.). In the fourth trial the arms were cleaned with a dry swab and 80.5 per cent. (66 of 82) tested after vaccination had positive sera. In this trial no pre-vaccination sera were available but the estimated pre-vaccination immunity rate (from previous surveys) was 5 per cent. In all these trials the vaccine was suspended in distilled water.

In the fifth trial it was decided to compare the results of cleaning with water and ether, and also to compare the use of distilled water and gum acacia as diluents for the vaccine. There was no significant difference in the conversion rates when the arms were cleaned with water whether the vaccine was suspended in distilled water or gum acacia, the conversion rates being:—distilled water diluent, 48 of 56; gum acacia diluent, 39 of 48.

In one group, however, in which the virus was suspended in distilled water but ether was used to clean the arms, 21 of 26 (80.8 per cent.) became positive but in another only 17 of 29 (58.6 per cent.). The group vaccinated with vaccine in gum acacia whose arms were cleaned with ether were not tested because of shortage of mice.

There is a considerable discussion on the significance of inconclusive results in mouse neutralization tests. The total conversion rates for all vaccinations by scarification was 220 of 291 (75.6 per cent.) and if inconclusive results were included 239 of 291 (82.1 per cent.). Of those whose arms were cleaned with water the conversion rate was 150 of 181 (82.9 per cent.) (excluding inconclusive results) and in those for whom ether was used 70 of 110 (67.3 per cent.). There is a significant difference in the conversion rates in trials where ether was used as compared with trials in which water was used to clean the arms ($p = 0.001$). It is assumed that the low conversion rates in the trials in which ether was used was due in part to the fact that ether was used. It cannot be explained why this is so if the ether had been allowed to dry. [The reviewer wonders whether the same vaccinator did all the trials and whether the same care was taken to discourage the rubbing off of vaccine.]

In any event the results show that Yaba vaccine compares favourably

with similar yellow fever vaccines and it is estimated that a mass vaccination campaign with the Yaba vaccine would raise the immunity rate in a community to 80 per cent. or more.

G. W. A. Dick

DENGUE AND ALLIED FEVERS

HOTTA, S. **Partial Purification of the Mouse-Adapted Dengue Virus.** *Acta Scholae Med. Univ. in Kioto.* 1953, v. 31, No. 1, 7-10. [11 refs.]

This is a description of a complicated method of partial purification of a mouse-adapted strain of dengue virus contained in suspensions of the brains of mice which had become moribund after intracerebral inoculation with the strain.

The principle of the method was adsorption by kaolin from which the virus particles were obtained by elution. In the process there was a considerable loss of virus concentration but enough remained for tests of heat resistance. After exposure to 47°C. for 20 minutes the virus was still active; at 54°C. there was complete inactivation after 10 minutes, but only incomplete loss of activity after 5 minutes.

With electron-microscope examination the virus particles were seen as spherical bodies having a diameter of about 20 μ ; this size corresponded to that estimated for infective human serum tested by the Elford gradocol-membrane technique. It is stated that SABIN *et al.* (in RIVERS, *Viral and Rickettsial Diseases of Man*, 1948, 445) in 1945 described the virus particles in human serum as being dumb-bell shaped.

John W. D. Megaw

RABIES

SCHOOP, G. Über den derzeitigen Tollwutseuchenzug. [The Present Spread of Rabies] *Ztschr. f. Hyg. u. Infektionskr.* 1954, v. 138, No. 5, 415-26, 7 figs.

Rabies infection is known to have become widespread in Southern Germany after the Napoleonic wars and a similar spread which occurred after the first world war reached its peak in 1924. Western Germany remained free of infection, however, from 1925 until 1939 when the disease again became manifest after the Polish campaign. In 1940 and 1941 the infection seemed to have departed. Since then rabies has again spread in a huge ring from Posen as a centre, and although it was not possible to assess the magnitude of the problem owing to the disturbances of the war and post-war periods, it is now known that by the end of 1950 the train of infection crossed the frontier of Western Germany into Schleswig-Holstein. Maps illustrate the spread since 1950 and by the end of June 1953 the infection had appeared in a number of areas on the eastern frontiers of Western Germany and extending as far south as Bavaria. The disease was found mainly in carnivorous wild animals, notably the fox, and in the badger to a lesser extent. In the first 5 months of 1953 only 18 persons

were inoculated because of being bitten by sick animals, either domestic or wild, and none of these individuals developed the disease. That the sickness of all these animals was due to rabies infection could not be established.

It is stated that the danger of being bitten by the fox or domestic animals such as the dog is not great, as observation has shown that when these creatures are sick with rabies they do not deliberately attack human beings—the fox will bite only in self-defence, the sick domestic dog when its owners are too solicitous. Among foxes the epidemic is mostly spread in the early months of the year because food is then scarce and the animals fight among themselves. In February to April the rutting season also disturbs the normal equanimity of these creatures. The danger of spread to human beings is often over-emphasized and it is therefore important in order to avoid panic that the truth should be more generally known.

Prevention is discussed and there is reference to methods, such as the compulsory immunization of dogs, which are used in some countries. At present in Western Germany the policy is mainly to destroy wild foxes and badgers.

M. A. Delafield

COURTER, R. D. **Bat Rabies.** *Pub. Health Rep.* Wash. 1954, Jan., v. 69, No. 1, 9-16. [14 refs.]

The existence of rabies infection in bats of the United States was unknown until June 1953, when rabies virus was isolated from the brain of a yellow bat (*Dasypterus floridanus*) which had been killed in Florida while attacking a 7-year-old boy. Subsequently, in Florida, rabies virus was found in the brains of 5 yellow bats and one Seminole bat (*Lasiusurus seminola*) which were apparently normal and had been killed in flight while feeding. Both species are insectivorous and indigenous to the south-eastern United States. In September 1953, rabies virus was isolated from a bat which had made an unprovoked attack upon a woman in Pennsylvania and which, although its carcase was destroyed before its genus or species could be determined, was considered by those who had seen it to be insectivorous. The recognition of rabies infection in insectivorous bats both in Florida and in Pennsylvania has revealed a probable reservoir and source of infection in a new group of wild life, with feeding and living habits entirely different from those of animals previously known to harbour rabies virus in the United States, and marks a discovery "which may have far-reaching implications as a new public health problem".

As an aid to the understanding of this new problem, the author provides a review of bat rabies in Latin America, where the disease has existed for half a century and where the condition has been defined as "that form of rabies transmitted by bats and usually occurring in humans and in livestock as paralyses; also occurring in several forms among hemophagous and frugivorous bats".

Rabies virus transmitted by bats has occasioned epizootics of paralytic rabies in the livestock of Brazil, Trinidad, Mexico, Honduras and Venezuela, and an epidemic of ascending paralytic myelitis in human beings in southern Trinidad. The virus isolated from bats has been shown by pathological findings, animal inoculation, complement-fixation, cross-neutralization and protective tests to be closely related to classical strains of rabies virus, and has been likened to the *Oulo-fato* form of rabies found in indigenous dogs of French West Africa [this *Bulletin*, 1934, v. 31, 145] in that both viruses usually produce the paralytic form of rabies.

The haematophagous vampire bat, *Desmodus*, is the proved transmitter of bat rabies to human beings and animals. The non-haematophagous bats have not been considered as transmitters of rabies to other animals and human beings, although the disease has been recognized in at least 3 fruit-eating genera infected in nature, namely, *Phyllostoma*, *Artibeus* and *Hemiderma* (*Carollia*). The frequency with which rabies infection has been found, however, in non-haematophagous bats during epidemics among the blood-lapping bats and among livestock creates a strong suspicion that they play a very important rôle in either harbouring rabies virus or in transmitting it to the haematophagous bats and perhaps to animals. As with the blood-lapping bats, fruit-eating bats may be refractory to clinical infection with the rabies virus; the saliva of infected bats may, however, contain the virus when they manifest no evidence of disease.

Now, the possibility that bat rabies might be encountered in the United States has not, until recently, been seriously entertained, because the known habitat of the proved transmitter, *Desmodus*, is from the 30th parallel south latitude to the 28th parallel north latitude and is, therefore, some distance from the southern border of the country.

Last year, however, MALAGA-ALBA (*Texas Health Bull.*, 1953, v. 6, 4) reported bat rabies in 3 Mexican States bordering on the United States, and in 1952 a survey by the Pan American Sanitary Bureau revealed circumstantial evidence of the presence of vampire bats in southern California. These findings, together with the recent recognition of rabies infection among insectivorous bats in Florida and Pennsylvania, "may lead to a change in the concept of a bat-rabies problem in the United States". Much study will obviously be required on the prevalence of rabies infection in bats, the pathogenesis of the disease and the nature of the virus in them, and the transmission of rabies by insectivorous bats to other animals.

G. Stuart

SANBORN, C. C. **Bats of the United States.** *Pub. Health Rep.* Wash. 1954, Jan., v. 69, No. 1, 17/28, 6 figs. [12 refs.]

SOURANDER, P. **Effect of Rabies Virus on Mass and Nucleic Acids of Embryonic Nerve Cells.** *Acta Path. et Microb. Scandinavica.* 1953, Suppl. 95, 87 pp., 33 figs. (1 folding). [239 refs.]

The main object of this investigation was to throw light on how neurotropic viral infection affected the protein and nucleic acid in the single nerve cell. In addition Sourander reviews the literature on cellular changes associated with viral multiplication as evidenced by observations by the light microscope, the electron microscope, the UV microscope and by microspectrographic methods, and discusses the various theories of viral multiplication. The general conclusion is that in the case of rabies virus, the virus acts as a parasite on the nucleoprotein-producing apparatus of the cell. This hypothesis was first formulated by CASPERSSON and HYDÉN (*Nord. Med. Tidskr.*, 1945, v. 28, 2631) and is supported by the views of LURIA and of BURNET and LIND. Luria (in M. DELBRUCK: *Viruses 1950*, Pasadena 1950), from a study of bacteria and bacteriophages maintained that the relationship between virus and host was a question of parasitism at genetic level. He believed that after the virus invades the host cell the cell disintegrates and a number of subunits are released. These units supplant the host's genetic apparatus which disintegrates and they supply the genes of the virus. Thus a new unit is formed, the "virus infected cell." This cell contains the host cell's enzymatic systems which are controlled by the

genetic determinants of the virus. The latter proceed to direct the synthesis of viral material from nonspecific building blocks of the host cell. The subunits are reproduced independently by autocatalytic action. Burnet and Lind (cited by HOYLE, 1952, *Symposium on the Nature of Virus Multiplication*, Soc. for Gen. Microbiol., Oxford, 1952) advanced a similar hypothesis to explain virus recombinants. The author's experimental work in support of the above hypothesis is as follows:

" Study was made of the young motor nerve cells in the brachial enlargement of the spinal cord of normal chick embryos and ones infected with the Flury strain of rabies virus.

" The total dry weight after lipid extraction, i.e., the bulk of the protein, was analyzed in the single cell with the x-ray microradiographic technic of ENGSTRÖM and LINDSTRÖM as modified by BRATTGÅRD and HYDÉN. The nucleic acid content was studied by taking ultraviolet photographs at 2570 Å, near the absorption maximum of the nucleic acids, and noting the results before and after treatment with ribonuclease.

" Other parts of the nervous system were also examined in the ultraviolet range of the spectrum. The histologic picture was analyzed with several different staining methods, particular regard being given to the inflammatory response.

" The titer of the virus was determined by intracerebral injection of serial tenfold dilutions of pooled brain suspensions from rabies-infected chick embryos into 3 week old mice.

" The following observations were made :

" The total dry weight per noninfected motor nerve cell, i.e., the bulk of the protein per unit of volume, increased from the seventh to the ninth day of incubation. From the ninth to and including the twenty-first day of incubation, no further significant increase in the weight was noted. Calculated per cellular cytoplasm, the mass increased about twelvefold during the ninth to the twenty-first day. Judging from the ultraviolet micrographs the cytoplasm in the motor nerve cells of the noninfected chick embryo contained large amounts of RNA. No particular differences in the intensity of the absorption were noted at different times of the incubation.

" In the young motor nerve cells of the rabies-infected chick embryos the total dry weight per unit of volume was of about the same order two days after the inoculation as at the time of the inoculation, while the corresponding value for the control cells was slightly higher. The slight decrease in the dry weight of the nerve cells from the infected embryos was assumed to be due to the delay in development caused by the inoculation.

" Between the fifth and tenth day after the inoculation, the total amount of dry substance decreased successively in the virus-infected nerve cells to a value about one quarter that of the corresponding value for the control cells. When the mass was determined per cellular cytoplasm the value decreased much more—to about one tenth that for the control cells. The cytoplasmic content of RNA in the nerve cells from the infected embryos decreased successively and concomitantly with the value for mass, beginning five to six days after the inoculation. Ten days after the inoculation the nerve cells examined were practically emptied of RNA. On the same day it was noted that the pentose nucleoprotein fraction has disappeared from the cells.

" The increase in the virus titer and the decrease in the total dry weight and RNA could be correlated. The inflammatory response to the viral infection seemed to be secondary to the cytochemical changes, being manifested several days later.

" Obviously the Flury strain of rabies virus has a strong affinity for the

motor nerve cells of the chick embryo. The chemical changes observed in these cells appear to be associated with the reproduction of the virus.

"The relationship observed between the chemical changes and the viral multiplication supports the hypothesis of CASPERSSON and HYDÉN that the virus acts as a parasite on the nucleoprotein-producing apparatus of the cell.

"It seems likely that the Flury strain of rabies virus multiplies in the cytoplasm of the cell."

G. W. A. Dick

SOEKAWA, M. & KASHIKURA, N. On the Action of the Nitrogen Mustard to Rabies Virus. *Kitasato Arch. Exper. Med.* 1953, Sept., v. 26, No. 1, 75-82.

After brief reference to recent literature dealing with the action of nitrogen mustard on rabies virus, the authors record the results of experiments they carried out to ascertain the toxicity of this compound, NM, its behaviour while inactivating rabies virus, and the antigenic potency, as well as the safety, of vaccines containing virus so inactivated. Throughout the experiments 20 per cent. brain emulsions were employed; the rabies virus used was the brain tissue derived from rabbits or goats previously infected intracerebrally with either the MDH or the Nishigahara strain of rabies fixed-virus.

In their toxicity experiments the authors used brain emulsions, to which NM had been added in final concentrations varying between 0·01 and 1·0 per cent.; after such additions the brain emulsions, kept at 22-25°C., were gently agitated several times hourly for the first 6 hours and thereafter several times daily. Mice of 12 gm. weight were, at various times after the addition of the NM, inoculated intracerebrally, each with 0·03 ml. of samples taken from the brain emulsions treated with NM, and observed during a period of 2 weeks for signs of NM intoxication. Results showed that toxicity decreased in proportion to the time elapsing after addition of NM to the brain emulsions, and that the time required for the complete disappearance of toxicity was in proportion to the amount of NM added. Thus NM, when added in a concentration of 0·1 per cent., killed all mice after 1½ hours from the time of its addition but, although still lethal 48 hours after such addition, was no longer so after 72 hours. Again, NM, added in concentrations of 0·5 and 1·0 per cent., remained toxic after 168 hours from the time of its addition, but was non-toxic after 240 hours.

As regards the inactivation of rabies virus by NM, it was found that a close and strict relationship existed between the titre of the virus and the amount of NM required for inactivation. Thus, whereas NM in a concentration of 0·05 per cent. was able to inactivate virus with a titre of $10^{-7.24}$ in the original emulsion, it proved, in the same concentration, incapable of inactivating virus in 3 other emulsions with titres, respectively, of $10^{-8.34}$, $10^{-8.37}$ and 10^{-9} . It was also found that a close relationship existed between the amount of NM used and the rate of inactivation. When an adequate amount of NM was added, inactivation was completed within a short time, but when the quantity was insufficient, inactivation did not take place at all. Thus, whereas NM, in a concentration of 0·025 per cent., failed even after 144 hours from the time of its addition, to inactivate virus with a titre of $10^{-7.24}$ it was found, when in a concentration of 0·05 per cent., to have inactivated virus of the same titre 4 hours after its addition. These results differ markedly from those observed when other chemical agents, such as phenol, are used for inactivation; with such other agents, even when added in low concentration, inactivation proceeds gradually and continuously over a long period until complete. This difference may be

accounted for by the rapid fixation of NM to the virus and to the rapid decomposition of the chemical compound.

With a view to ensuring the production of highly potent vaccines, experiments were carried out to determine the optimum conditions for virus inactivation by NM. Four vaccines were prepared: to 20 per cent. fixed-virus brain emulsions NM was added in concentrations of 1·0 per cent. for vaccine No. 1, 0·5 per cent. for vaccine No. 2, 0·2 per cent. for vaccine No. 3, and 0·1 per cent. for vaccine No. 4. All 4 brain emulsions were kept at 24°C. In preparing vaccines No. 1 and No. 2, merzonin was added in a concentration of 0·01 per cent. after the filtration of 20 per cent. NM-treated rabbit brain emulsion through a 120 mesh metal screen. After inactivation at 24°C. for 3 days, during which they were gently agitated several times a day, these emulsions were stored in a refrigerator. In preparing vaccines No. 3 and No. 4, 20 per cent. goat brain emulsions treated with NM were diluted two-fold in saline, after having been kept at 24°C. for 3 and 5 hours, respectively, and agitated several times hourly; to each emulsion merzonin in a concentration of 0·01 per cent. was added after filtration as above; storage was in a refrigerator. Vaccines were diluted with saline so as to contain 0·5 per cent. brain tissue, and mice, weighing 12 gm., were each injected intraperitoneally with 0·25 ml. of the diluted vaccine every second day for 6 doses. On the 14th day after the first injection, 0·03 ml. of serial ten-fold dilutions of challenge virus was inoculated intracerebrally into the mice under test. The protection values of the vaccines in LD₅₀ were then estimated. From the results it emerged that vaccine of the highest antigenic potency could be obtained, when NM in the lowest amount necessary to inactivate all the virus had been added. Thus vaccines No. 1 and No. 2, prepared from 20 per cent. rabbit brain emulsions with a virus titre of 10^{-7·29}, inactivated with 1·0 and 0·5 per cent. NM respectively, and containing these same percentages of NM in the final products, gave protection values in LD₅₀ of 210 and 36, respectively, while vaccines No. 3 and No. 4, prepared from 20 per cent. goat brain emulsions with virus titres of 10⁻⁹ and 10^{-8·34}, inactivated with 0·2 and 0·1 per cent. NM, respectively, and containing 0·1 and 0·05 per cent. NM in the final products, gave protection values in LD₅₀ of 31, 120 and 64, 120, respectively.

Finally, safety tests on the virus inactivated with NM were carried out by inoculating, with the above-mentioned vaccines after storage in a refrigerator for 14 or more days, guineapigs (2 cc. intraperitoneally), mice (0·03 cc. intracerebrally), rabbits (0·2 cc. intracerebrally) and dogs (3 cc. subcutaneously). Tested animals showed no evidence of toxicity due to NM.

G. Stuart

GALLO, P. Propiedades biológicas del virus fijo de la rabia paresiente de Venezuela, cepa "Bolívar" y resistencia frente algunos agentes físicos y químicos. [Biological Properties of the Bolívar Strain of Fixed Rabies Virus from Venezuela and its Resistance to Certain Physical and Chemical Agents] *Rev. Med. Vet. y Parasit.* Caracas. 1952, July-Dec., v. 11, Nos. 3/4, 195-204. English summary.

KOPROWSKI, H. & BLACK, J. Studies on Chick-Embryo-Adapted Rabies Virus. IV. Immunization of Guinea-Pigs and Description of a Potency Control Test. *J. Immunology.* 1954, Jan., v. 72, No. 1, 79-84.

It has been found that the currently employed mouse potency test (Habel) for brain-tissue rabies vaccines containing inactivated virus cannot be applied to live chick-embryo vaccines, since the latter do not immunize mice when infected parenterally. Koprowski and Black report the ability

of the Flury strain to immunize guineapigs and the development of a potency test in these animals.

It was found that guineapigs inoculated into the leg muscles with 1 ml. of a 10 per cent. suspension of Flury-strain chick-embryo virus were resistant to challenge inoculation with street virus 12 days after vaccination. The challenge of these vaccinated guineapigs consisted of giving injections of 0.05 ml. bilaterally into the masseter muscle and 0.1 ml. unilaterally into the thigh muscle, of NYC strain of rabies virus in the form of a 10 per cent. suspension of salivary gland. The resistance to challenge was accompanied by the development of neutralizing antibodies, but there was no evidence of any antibodies in brain tissue of immunized guineapigs like the neutralizing effect observed by KUBES and GALLIA [this *Bulletin*, 1944, v. 41, 905].

Results of comparative immunization of dogs and guineapigs indicate that the latter species may be used successfully to control the potency of canine vaccines and a proposed potency test is described [for the details of which the original paper should be consulted].

G. W. A. Dick

KOPROWSKI, H. & BLACK, J. Studies on Chick-Embryo-Adapted Rabies Virus. V. Protection of Animals with Antiserum and Living Attenuated Virus after Exposure to Street Strain of Rabies Virus. *J. Immunology*. 1954, Jan., v. 72, No. 1, 85-93. [14 refs.]

This study was undertaken in order to evaluate in the laboratory the results of treatment of animals exposed to the NYC strain of street virus with rabies antiserum or Flury-strain virus or both. An analysis of the data presented shows that guineapigs inoculated with antiserum 24 hours after exposure to street virus showed a significant ($p = 0.01$) degree of protection compared with controls. Combined treatment with antiserum and Flury virus gave significantly better results than treatment with antiserum alone. There was no significant difference in the protection of guineapigs which received Flury strain either 1 day or 7 days after administration of antiserum.

In dogs there was also a significant difference in the mortalities of those treated with antiserum or antiserum plus Flury vaccines after exposure to street virus ($p = < 0.01$).

The serological evidence of immunity is discussed and the data obtained from guineapigs and dogs suggest that treatment with immune serum should be effective in most cases of human exposure provided that it is administered promptly and in adequate quantities. In case of severe exposure it is felt that (once the antigenic dose for man is determined) the combined treatment with antiserum and Flury-strain virus should be considered.

G. W. A. Dick

KOPROWSKI, H., BLACK, J. & NELSEN, Doris J. Studies on Chick-Embryo-Adapted Rabies Virus. VI. Further Changes in Pathogenic Properties following Prolonged Cultivation in the Developing Chick Embryo. *J. Immunology*. 1954, Jan., v. 72, No. 1, 94-106, 4 figs. [10 refs.]

This paper presents the results of a study of high egg-passage (HEP) Flury strain when tested in a number of animal species. At the level of the 176-182nd egg passage the virus changed into a form consistently non-pathogenic for adult mice. Suckling mice remained fully susceptible to intracerebral inoculation. This loss of pathogenicity for adult mice did not influence the immunizing capacity of the Flury virus. The HEP Flury

virus became non-pathogenic for rabbits and dogs but monkeys remained as susceptible to infection as baby mice.

Titrations in hamsters and guineapigs indicated that the HEP Flury strain consists of a non-homogeneous viral population. Experiments are described in which different segments of the viral population were separated and analysed [and the original paper should be consulted for details of the experiments and the possible interpretations of the results, which cannot be adequately abstracted].

G. W. A. Dick

KUWATA, T., KUNIYOSHI, T. & ITO, H. **Paralytic Rabies: its Pathology and Nature of the Virus.** *Acta Path. Japonica.* 1952, Jan., v. 2, No. 1, 23-33, 1 chart & 5 figs. on 2 pls. [10 refs.]

The case of human rabies described in this article was one in which classical symptoms, such as mental excitement and difficulty in swallowing, were wholly lacking, and in which paralysis of the extremities was the sole feature of importance. Reports on cases of this nature have been comparatively infrequent, although the association of paralysis with rabies has long been recognized. The case in question occurred in a 28-year-old woman in Japan who, after 3 days' malaise and slight fever, had developed a weakness of the upper extremities and an inability to stand up without assistance. For the next 3 days slight fever persisted, and on the 6th day of illness the patient was admitted to hospital with complete paralysis of both upper and lower extremities. During the 2 days in hospital before she died, the patient had continuous fever, finally reaching 39.9°C.; consciousness remained unimpaired throughout; no salivation, no dysphagia and no abnormality of sensation whatsoever were noted; there was no nuchal rigidity; the Kernig and Babinski signs, as well as the patellar reflex, were negative; the speech was affected and the voice became hoarse. Blood examination showed a white cell count of 8,400 per cmm. (90 per cent. polymorphonuclear, 10 per cent. lymphocytes).

The case was brought for autopsy 12 hours after death. The gross pathology and the histological findings are described, and of the latter, two are of special interest: the Ammon's horn, substantia nigra, and Purkinje cells of the cerebellum were free from the marked pathological changes so frequently found there in rabies as to make them near-characteristic of that disease; and in the spinal cord, pathological changes were more intense in the upper than in the lower segments and very largely confined to the anterior horn of the grey matter. Thus, Ammon's horn showed but slight swelling of the nerve cells and an absence of perivascular cuffing; the substantia nigra was almost intact, and the Purkinje cells were only slightly oedematous. In the anterior horn of the cervical cord, cell infiltration and congestion were moderately severe; the nerve cells showed fatty degeneration, chromatolysis and, in parts, pyknosis of the nuclei; in the thoracic cord, the nerve cells were similarly affected, but inflammatory changes were relatively slight; in the lumbar cord, cell infiltration and congestion were very slight. In the posterior horn, only slight cell infiltration was present.

The clinical and pathological findings at first suggested poliomyelitis, no history of dog-bite having been given by the patient. From brain and spinal cord, however, a virus was isolated, which the results of neutralization and protection tests proved to be rabies virus, Shinohara strain. Later investigation elicited the information that the patient had been bitten by a dog some 19 months prior to the onset of her fatal illness; no trace of such wounding had, however, been noted on physical examination. In this connexion it has been suggested by LOVE (1944, *J. Pediat.*, v. 24, 312) that

paralytic rabies lacking classical symptoms is more likely to develop after a minor and apparently insignificant bite; such a suggestion would obviously be applicable to the case under review.

Both in clinical history and histological findings, however, the present case differed considerably from typical paralytic rabies. Its clinical picture showed, for example, neither abnormality of sensation nor later development of the classical symptoms of rabies. Again, the pathological changes characteristic of paralytic rabies were largely absent from the cerebellum; moreover, in the spinal cord, such changes were mainly confined to the anterior horn, the posterior horn being but little affected. These findings in the cord were identical with the distribution of lesions in poliomyelitis, but differed from those in cases of acute rabic myelitis seen in Trinidad some 25 years ago [this *Bulletin*, 1932, v. 29, 595]—cases, the clinical course of which was an ascending myelitis of the Landry type and in which the histological changes in the spinal cord were distributed almost equally in the posterior horn as in the anterior horn.

The authors conclude by inviting attention to the possibility of such departures from the ordinary findings in paralytic rabies as have been instanced by the case described.

G. Stuart

BALTAZARD, M. & GHODSSI, M. Prévention de la rage humaine. Traitem-
ment des mordus par loups enragés en Iran. [**Prevention of Human
Rabies. Treatment of Persons Bitten by Rabid Wolves in Iran**] *Rev.
d'Immunologie*. 1953, v. 17, No. 6, 366-71.

In this paper the authors detail the results of 13 years' experience at the Pasteur Institute, Tehran, in the treatment of persons bitten by wolves. Two types of vaccine were mainly employed: until 1946, that of Pereira de Silva (phenolized rabbit brain); thereafter, that of Semple (phenolized sheep brain). From time to time, however, Ferran's hyperintensive method was tried, as were other methods in which the dosage of vaccine was increased, the treatment prolonged or repeated. During the 13 years' period reviewed 325 persons were treated for wolf-bite; of that number, 186 had been bitten on the face, head or neck, 74 on the upper extremities, 5 on the lower extremities, and 60 on the trunk; 307 had exceptionally severe wounds.

Of the 325 persons bitten—and all with wolf-bites received treatment as a routine—60 (18.5 per cent.) died of rabies within the period which conventionally placed them in the category of "failures of treatment". Of 127 persons who arrived for treatment within one week of receiving their bites, 35 (28 per cent.) died of rabies. Of 186 persons bitten on the head, 53 (28 per cent.) contracted rabies. The several viruses recovered from the brains of rabid wolves or of persons dead of rabies showed no significant difference in virulence from the street viruses isolated from rabid dogs in Iran and in other countries. To the severity of the wounding and to the location of the bite, therefore, failure of treatment had to be ascribed.

For an accurate assessment of the value of treatment, the authors point out that the mortality figure of 18.5 per cent. cited above is misleading. Thus if calculation is based solely on the number of bitten persons actually at-risk, namely, on those in groups in which proof of rabies in the biting animal has been established by the death from rabies of one or more of the bitten persons in such groups, then a mortality figure of 25 per cent. results—a figure which, with respect to those bitten in the head, rises to 42 per cent.

Such mortality figures among treated persons have raised the question as

to whether the mortality would have been higher had no treatment been given. In this connexion the authors refer to statistics published by NIKOLIC [this *Bulletin*, 1952, v. 49, 946] and by GREMLIZA [*ibid.*, 1953, v. 50, 930]. Nicolic compared the mortality among persons bitten by rabid wolves before the discovery of Pasteurian treatment with that among persons similarly at-risk treated since that time by antirabies vaccine in various countries, including Iran. He found that among 169 persons bitten in pre-treatment days there were 103 deaths, *i.e.*, 61 per cent., and among 258 treated by one or other recognized method there were 69 deaths, *i.e.*, 27 per cent.—a finding in harmony with the authors' mortality figure of 25 per cent. in their group in which proof of rabies in the biting animal had been established. Gremliza found that of 32 persons bitten in Iran by the same rabid wolf—persons who had remained untreated or had arrived at the Pasteur Institute too late for treatment to be effective (23 days after having been bitten)—15 died of rabies, *i.e.* 47 per cent. Judged by Nicolic's mortality statistics—61 per cent. among the untreated and 27 per cent. among the treated—treatment, whatever the method employed, has resulted in a lowering of the mortality figure by more than one-half. Despite such reductions the authors feel, however, that the methods of treatment now practised on persons bitten by wolves proved to have been rabid at the time of biting fall far short of requirement. Thus, although at the Pasteur Institute in Tehran during the past 13 years only 9 persons bitten by rabid dogs and thereafter treated have died of rabies, the mortality percentage during that period among those treated for bites on the head by rabid wolves has been no less than 42—a figure little short of that (47) observed by Gremliza in his untreated series.

In an attempt to improve this unsatisfactory state of affairs the authors, at the invitation of the WHO Expert Committee on Rabies, undertook 3 years ago a trial treatment with hyperimmune serum of persons suffering from wolf-bites. At first such treatment was applied only to those arriving at the Institute within 72 hours of the biting, but later it was administered to all arriving with wolf-bites. The results of this trial will be published later. In the meantime the authors stress the need for a more effective method of treatment than exists at present and, to this end, for research to be directed towards the development of a vaccine of high antigenic potency, preferably one prepared from living avirulent viruses.

G. Stuart

CARNEIRO, V. **Problems of Vaccination against Rabies.** 17 mimeographed pp. [60 refs.]
[Paper from First Inter-American Congress of Public Health, 26 Sept.-1 Oct. 1952,
Havana, Cuba. Symposium: Zoonoses—Rabies.] CIH/15 (Eng.). Original:
Portuguese.

A general review and discussion.

McFADZEEAN, A. J. S. & CHOA, G. H. **The Neuroparalytic Accidents of
Antirabies Vaccination.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953,
Sept., v. 47, No. 5, 372-86. [58 refs.]

This is a most valuable up-to-date treatise on the neuroparalytic accidents which may follow antirabies vaccination. A historical introduction draws attention to the early confusion, in the late eighties of the 19th century, between paralytic rabies following the injection of fixed virus vaccines and paralytic accidents due to some as yet undetermined substance in the vaccine. In Hong Kong in the years 1949-1952, 14,119 patients were given the phenolized Semple vaccine; 17 cases of neuroparalytic accident were known to have occurred, an incidence of 1 in 831. This rate is more in

accord with figures reported by various authorities in the U.S.A. than with those of GREENWOOD (1 in 6,805) given in the tenth report of the League of Nations. The authors believe that many patients who develop untoward symptoms after antirabic vaccination seek relief from practitioners of indigenous systems of medicine, thus eluding scientific observation and recording. The incidence was higher in males and in those over 20 years of age.

The two differing histopathological pictures found in the literature were represented among the Hong Kong cases: Group I with perivascular myelinoclasia, with the clinical picture of myelitis, meningo-encephalitis or encephalitis; Group II with polyradiculoneuronitis, with clinical pictures ranging from isolated 7th nerve palsy to general involvement of all nerves and muscles. The pathogenesis of the accidents is discussed. Ample evidence suggests strongly that Group I accidents are an expression of a sensitization reaction to the nerve substance contained in the vaccine. The response of this type to ACTH and cortisone strengthens this conception. The pathogenesis of Group II accidents is unknown.

The clinical and laboratory findings of 14 personally observed cases of neuroparalytic accident are briefly described; 9 were Group I accidents and 5 were Group II. In Group I cases there was polymorphonuclear leucocytosis with increase in protein and cells in the cerebrospinal fluid. In Group II no such leucocytosis was found but there was albumino-cytological dissociation (with high protein content and a low cell count) in the cerebrospinal fluid.

The significance of extraneuronal reactions is discussed. It is concluded that local reactions are of no significance and that intradermal tests are valueless. ACTH (20 mgm. daily by slow intravenous drip) was administered in 3 cases of Group I accident. No further extension of the lesions occurred, improvement was rapid and in 1 case dramatic. One case of Group II accident was similarly treated, with only partial relief. It was thought probable that the rapid relief of paraesthesiae and muscle pains in this case was due to dispersal of oedema at the nerve roots, without effect on the irreversible changes in the ventral horn cells which were presumably responsible for the paralysis of the limbs. Three cases of Group I accident and one of Group II were treated with diphenhydramine intravenously, without appreciable effect.

The authors are of opinion that if a neuroparalytic accident occurs during the course of administration of antirabies vaccine to a patient bitten by an animal known to be rabid, ACTH should be given to control the hypersensitivity response and the injections of vaccine should continue. Six of the Hong Kong patients had splenomegaly, probably malarial in origin. The authors suggest that a hypertrophied reticulo-endothelial system might result in overproduction of antibody.

G. R. McRobert

KAWAI, S., OKONOGI, T. & KIJIMA, S. **Two Autopsy Cases of Disseminated Encephalomyelitis following Antirabic Vaccination.** *Acta Path. Japonica.* 1952, Apr., v. 2, No. 2, 81-6, 2 figs. [21 refs.]

In the Gunma Prefecture of Japan, during the period February 1949-October 1950, 3 serious neuroparalytic accidents developed among 659 persons who had received antirabies treatment. Of those so affected, 2, with clinical histories of acute ascending myelitis, died and were brought for autopsy. In these 2 cases onset of paralysis had occurred 17 and 44 days respectively, after conclusion of treatment.

In both cases the histological picture was one of typical perivascular

demyelination [the acute perivascular myelinoclasia of MARSDEN and HURST (*Brain*, 1932, v. 55, 181)] and was regarded as indistinguishable from that seen in encephalomyelitis following vaccinia, in the secondary types of encephalomyelitis following the infectious diseases of childhood (measles, mumps, chickenpox), or in multiple sclerosis. The authors briefly review the several theories which have been advanced as to the cause of such serious complications following antirabies treatment but, finding themselves unable to reach any final conclusion in this respect, stress the need for further immunological and biological research.

G. Stuart

NIKOLITSCH, M. Über die Ätiologie der Paralysen im Anschluss an anti-rabische Impfung. [**The Aetiology of Paralysis Associated with Anti-rabies Vaccination**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 23-7.

The English summary appended to the paper is as follows:—

"11 rabbits were vaccinated against rabies, 6 of which were treated with insulin shocks 10 days later. Two of the shocked animals developed ascending paralysis resembling the palsy seen in humans after antirabic treatment. It is assumed that the endotoxins of fixed virus have a damaging effect on certain cells of the nervous system predisposing them for the paralysis. This opinion is supported by UNO statistics showing that only certain predisposed groups of population are liable to suffer nervous disorders after antirabic treatment while others remain free."

REAGAN, R. L., STRAND, Ninalee & BRUECKNER, A. L. **Rabies Street Virus Strains in the Syrian Hamster.** *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 57-8.

"Hamsters exposed rectally to 5 rabies virus strains showed an incubation period between 5 to 8 days in comparison to hamsters exposed intracocularly whose incubation period was between 14 to 20 days. Brains removed from hamsters showing rabies symptoms contained numerous 'Negri bodies'."

YAOI, H., TAKEI, M., MAEDA, H. & YAOI, H., Jr. **Studies on the Rabies Vaccine. Xth Report: Resistance to Rabies and Rabicidal Antibodies in Dogs, immunized with Inactivated Anti-Rabies Vaccine.** *Yokohama Med. Bull.* 1953, June, v. 4, No. 3, 129-41, 2 figs. [10 refs.]

See also this *Bulletin*, 1953, v. 50, 622, 623.

PLAQUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

GILLET, J. La peste au Congo belge. [**Plague in the Belgian Congo**] *Inst. Roy. Colonial Belge Bull. des Séances.* 1953, v. 24, No. 4, 1385-41. [21 refs.]

This paper has been drafted in connexion with a nosological map which is to be published in a general Atlas of the Belgian Congo. It describes the distribution of plague in the various foci and names the local insect vectors and rodent hosts. There is a very brief note on treatment and prevention. This is a useful short summary of the position with which readers of this *Bulletin* will already be familiar.

DAVIS, D. E. **The Characteristics of Rat Populations.** *Quart. Rev. Biol.* 1953, Dec., v. 28, No. 4, 373-401, 15 figs. [Numerous refs.]

A study of *Rattus norvegicus*.

MEYER, K. F., QUAN, S. F., McCURMB, F. R. & LARSON, A. **Effective Treatment of Plague.** Reprinted from *Ann. New York Acad. Sci.* 1952, Dec., v. 55, Art. 6, 1228-74, 18 figs. [Numerous refs.]

In this paper, which is dated December 1952, the authors present a critical review of developments in the therapy of plague since about the year 1940. In the useful bibliography only one of the 84 references to publications relates to an article appearing in 1951, and the only reference to the treatment of human plague by the newer antibiotics, aureomycin and chloramphenicol, consists of data on the successful treatment of 3 patients.

Detailed descriptions are given of the considerable amount of work done on the subject at the Hooper Foundation where important studies have been carried out on the treatment of mice and monkeys experimentally inoculated with *Pasteurella pestis*; the drugs tested were sulphonamides, streptomycin and many of the newer antibiotics. The paper is well illustrated with charts, graphs and tables.

John W. D. Megaw

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

BRÜCK, E. & BRANDIS, H. Untersuchungen über Vibionen-Hämolysine. [**Studies on Vibrio Haemolysins**] *Ztschr. f. Hyg. u. Infektionskr.* 1953, v. 138, No. 1, 1-8. [15 refs.]

The authors investigated the haemolysin production of 14 vibrio strains, including 5 German strains isolated from water, 5 Indian water strains not agglutinating with cholera O antiserum, 3 El Tor strains and 1 Celebes strain. All but 2 of these organisms fell into Heiberg's Group I. The haemolysin tests were done with sheep cells and were read after incubation for 2 hours at 37°C. followed by overnight refrigeration.

All the strains produced a soluble haemolysin, the activity of which was demonstrable in Berkefeld filtrates of 3-day broth cultures but not in Seitz filtrates. The haemolysin remained active in heat-killed broth cultures, e.g. one vibrio strain was killed by a temperature of 50°C. in 15 minutes, but the haemolytic activity of the culture remained intact and required 40 minutes' exposure to this temperature for complete destruction. The haemolysin also survived ultrasonic vibration of sufficient intensity to kill the parent strain.

B. Moore

ROGERS, L. **The Control of Cholera Epidemics in India by Compulsory Anti-Cholera Inoculation of Pilgrims before travelling through Infected Districts to attend Fairs.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Jan., v. 48, No. 1, 42-9. [10 refs.]

The author, who has long advocated compulsory inoculation as a measure for the prevention of the spread of cholera by pilgrims attending the great religious Fairs which are held at frequent intervals in India, now presents figures of incidence of the disease in relation to the application of the measure, which was sanctioned by the Central Board of Health in 1940.

In considering the possible effect of compulsory inoculation account is taken of climatic factors which may affect the occurrence of outbreaks, it having been shown that a failure or serious deficiency of the monsoon rains in the preceding year produces conditions which are specially favourable to epidemic prevalence. The available figures are examined in relation to (a) all-India incidence of cholera in the periods before and after the introduction of compulsory inoculation, and (b) more local incidence directly related to the major pilgrimages.

During the 4 decades preceding 1940, the average annual all-India death rates from cholera were respectively 1.91, 1.63, 0.94 and 0.65 per mille, a steady decline being shown. It is stated that the incidence of cholera in each of these decades depended (a) on the occurrence of years of very high cholera mortality associated with the Kumbh Fairs which are held at 12-year intervals at Allahabad and Hardwar, and (b) on serious deficiencies of the monsoon rains of the previous years.

In the 1930-39 period no failure of the monsoon occurred and the only years of high incidence were 1930 and 1938 in which the Fairs were held at Allahabad and Hardwar respectively.

In the 12-year period 1940-1951 in which compulsory inoculation during the pilgrimages was employed the average annual all-India cholera death rate was 0.64 per mille, no reduction being shown as compared with the previous decade. The very considerable mortality in the period was mainly due to high epidemic prevalence in some areas in the years 1943 and 1944, in which over 750,000 deaths occurred; the figure for 1943 was higher than any recorded in the previous 40 years. The author attributes this high incidence to scarcity and high food prices in these war years and suggests that this factor, affecting certain Provinces, would obscure the possible value of inoculation of pilgrims attending the religious Fairs.

Cholera incidence more closely related to the Kumbh Fairs is examined on the basis of the mortality occurring in the years of the Fair, in the Provinces most liable to be infected during the pilgrimage and after dispersal of those attending it. During the period 1882-1930 the Fair was held at Allahabad on 5 occasions and in each year of the pilgrimage heavy mortality from cholera occurred in Bihar-Orissa and the United Provinces. The average annual cholera mortality for the 5 pilgrimage years in Bihar-Orissa was 4.65 per mille. In comparison, in the year of the next Fair at Allahabad, 1942, when anticholera inoculation was carried out on a large scale, the rate was 0.7 per mille. The corresponding rates for the United Provinces in the same periods were respectively 2.57 and 0.1 per mille.

During the period 1867-1938 the Fair was held at Hardwar on 7 occasions. Subsequent spread to the Punjab, which is specially liable to infection from that source, resulted in an average annual mortality of 0.92 per mille for the 7 years in that Province. In the next Fair year at Hardwar, 1950, in which over a million pilgrims were inoculated, the rate was 0.01 per mille. It is noted that only 11 cases of cholera were found during this pilgrimage: all were reported and immediately isolated, no subsequent spread occurring. Other instances are given of the value of the measure in preventing spread of cholera by pilgrims.

J. Taylor

DE, S. N. & CHATTERJE, D. N. **An Experimental Study of the Mechanism of Action of *Vibrio cholerae* on the Intestinal Mucous Membrane.** *J. Path. & Bact.* 1953, Oct., v. 66, No. 2, 559-62. [10 refs.]

In relation to the hypothesis that the outpouring of fluid in cholera may be due to an increased permeability of the capillaries the action of *V.*

cholerae was studied in loops of small intestine isolated by ligatures. The procedure adopted was to inject a small quantity of a 24-hour culture of the vibrio into the isolated loop of rabbits' intestine and then to return it to the abdomen. At post mortem, 24 hours later, the loop and its contents and the sections above and below it were examined.

In contrast to the appearances in control animals, in which the loop was seen to be collapsed and empty, the loop in the inoculated animals was found to be swollen, and distended by fluid of a rice-water character with a pinkish colour but containing few red cells.

The fluid contained flecks of mucus with numerous epithelial cells and vibrios. Its albumin content varied from 1·0 to 3·8 per cent. Histological examination of the intestinal wall showed marked oedema and widening of the submucosa: the tissue spaces as well as the lymphatics were dilated and the larger blood vessels engorged. There was no evidence of cellular infiltration but the summits of the villi were necrotic.

The small intestine proximal to the loop was distended by yellow fluid with an albumin content of 0·42 to 0·50 per cent., while the portion below the loop was collapsed and empty. In animals in which Evans blue had been injected intravenously 4 hours after ligation of the intestine and inoculation with the culture, the contents of the loop were coloured blue. The sections proximal to the loop in both inoculated animals and controls showed little or no trace of the dye.

It is concluded from these observations that the vibrio or its products had increased the permeability of the intestinal capillaries with the result that plasma had escaped into the tissues and eventually through the necrosed superficial layer of the mucosa into the lumen of the intestine.

The authors do not consider that the low level of protein content of the cholera stool, which is always found, disproves this conception. They had found the contents of the small intestine in cholera to show a high percentage of albumin and refer to the observation of EVANS that when an animal's own serum is introduced with a loop of its small intestine it is completely absorbed. This absorption of homologous protein would account for its absence from the stool.

John Taylor

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

ARTIGAS J., J. Hallazgo de *Entamoeba histolytica* en muestra de agua potable de Osorno. Nueva técnica de investigación. [Finding of *Entamoeba histolytica* in Drinking Water of Osorno (Chile)] *Bol. Informaciones Parasitarias Chilenas*. 1953, July–Sept., v. 8, No. 3, 44. English summary (6 lines).

With the view to determining the epidemiological rôle of water in the dissemination of intestinal protozoa, the author examined the drinking water of the city of Osorno by a technique involving prolonged centrifugation of the sample, decantation of supernatant fluid, and concentration of the sediment by the zinc sulphate flotation method. In a sample of 10 litres of water analysed in this way, 2 cysts with the distinctive characters of

Entamoeba histolytica were found, and it is concluded that the presence of this organism in the drinking water, which is consumed by the townspeople, is significant. [However, the author has not taken into consideration that the cysts found by him might—and most probably did—belong to the free-living amoeba, *E. moskowskii*, which occurs in sewage and polluted waters, as well as in ponds (AMARAL and LEAL, *Rev. Paulist. Med.*, 1949, v. 34, 173; also this *Bulletin*, 1943, v. 40, 311; 1954, v. 51, 588).]

C. A. Hoare

REES, C. W., BAERNSTEIN, H. D., REARDON, Lucy V. & PHILLIPS, Laura.

Some Interactions in Vitro of *Endamoeba histolytica* and Single Species of Microbial Symbionts. *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1002-14, 4 figs. [27 refs.]

With a view to the elucidation of the pathogenesis of amoebiasis, on the basis of the association between *Entamoeba histolytica* and bacteria in the host's intestine, the authors studied the interaction *in vitro* between the amoeba and selected single species of bacteria. A culture of *E. histolytica* growing with *Trypanosoma cruzi* (1 cc.) was inoculated into a medium consisting of whole-egg base overlaid with Stone's Locke solution + rice starch, which had previously been seeded with one of 17 species of bacteria used in these tests. In this medium the trypanosome failed to grow further. The effect of each bacterial species was assessed by counting the number of amoebae produced in the mixed culture. The yields ranged from 20,000 to 450,000 in the ascending order of the following bacterial associates: *Streptococcus zymogenes*, *Salmonella typhi*, *Shigella dysenteriae* types 1 and 2, *Bacillus subtilis*, *Staphylococcus albus*, *S. aureus*, *Salmonella paratyphi A*, *Proteus rettgeri*, *Shigella sonnei*, *Salmonella paratyphi B*, *Serratia marcescens* (*Chromobacterium prodigiosum*), " *Shigella paradysenteriae* ", *Bact. aerogenes*, Organism t, *Bact. coli*, *Clostridium welchii*.

It was found that in egg-white medium *E. histolytica* + t could not be maintained in serial subcultures even after enrichment with cholesterol and B vitamins, but growth was achieved with both *Bact. coli* and *Bact. aerogenes* if the medium was supplemented with cholesterol. It was also shown that *E. histolytica* produces a gelatinase or a protease or both, which liberate starch grains from ground rice particles. The production of CO₂ in the cultures was measured by the Eldridge-tube method which revealed more gas from cultures of the amoeba with 2 bacterial associates than from the latter alone. The increase is attributed to substances provided by the metabolism of the amoebae, resulting in greater activity of the bacteria. Production of gas by the amoebae themselves remained an open question. In the case of *Clostridium welchii* there was no difference in gas production in mixed cultures with the amoeba and in pure bacterial cultures. This is thought to be due to utilization of rice starch by the micro-organism. In view of intimate association between *E. histolytica* and bacteria, their relationship is regarded as symbiosis.

C. A. Hoare

FULTON, J. D. & SMITH, A. U. **Preservation of *Entamoeba histolytica* at -79°C. in the Presence of Glycerol.** *Ann. Trop. Med. & Parasit.* 1953, Oct., v. 47, No. 3, 240-46. [18 refs.]

The authors describe experiments on the effect of freezing upon cultures of *Entamoeba histolytica* accompanied by a single species of bacteria (*Bact. coli*). For this purpose, Dobell's fluid medium "hs" proved to be the most suitable. [The authors' statement that "*E. histolytica* will not

"multiply" in this medium is misleading, for some strains can be maintained in hs for years.] In these experiments varying proportions (5, 10 and 15 per cent.) of glycerol were added to the medium, and 0·5 to 1 cc. amounts of the culture were sealed in glass tubes measuring 1·0 cm. in diameter and 10 cm. in length, with a wall 0·5 mm. in thickness. The process of cooling the tubes was gradual, occupying 20 minutes from room temperature to 0°C. and 30 minutes from this point to -79°C., after which the ampoules were stored in a deep-freeze cabinet. Thawing was carried out in a water-bath at +40°C.

The 5 sets of experiments were devised to ascertain the influence upon the survival of the amoebae of (a) the concentration of glycerol incorporated in the medium, (b) the duration of incubation at 37°C. before freezing, and (c) the different rates of cooling. Cultures lacking glycerol were used as controls. The results of the experiments were assessed by direct examination of the cultures after thawing and by their sub-cultivation.

In these experiments it was demonstrated that cultures of *E. histolytica* containing glycerol remained viable after freezing at -79°C. for periods up to 65 days. The survival rate was the highest in cultures containing 5 per cent. glycerol, it was lower with 10 per cent., and with 15 per cent. the result was positive only once. On the other hand, none of the cultures lacking glycerol survived freezing. It was also shown that the survival of the amoebae was favoured by a slow rate of cooling, whereas rapid cooling proved to be harmful.

C. A. Hoare

HALLMAN, Frances A., MICHAELSON, J. B., BLUMENTHAL, H. & DELAMATER, J. N. **Studies on the Carbohydrate Metabolism of Endamoeba histolytica. I. The Utilization of Glucose.** Amer. J. Hyg. 1954, Jan., v. 59, No. 1, 128-81. [13 refs.]

The experiments described here were directed to the estimation of glucose consumed by *E. histolytica* in culture. The medium used for culturing the amoeba was similar to that described by the authors [this *Bulletin*, 1950, v. 47, 1086] with omission of carbohydrates. Glucose was added to give 0·1 per cent. concentration, along with dihydrostreptomycin and penicillin G to control growth of the accompanying bacterium *Bact. aerogenes*. The medium in amounts of 4 ml. was inoculated on one hand with amoebae plus bacteria, others with bacteria alone, while sterile tubes served as controls. Glucose estimations were made immediately on inoculation and after 24 hours' incubation. The most satisfactory precipitating agent for glucose estimations was found to be sulphuric acid and tungstate, which prevented interference with the estimations by the streptomycin present. The results in these tests were not satisfactory because of the poor growth of amoebae. Conditions similar to those described [this *Bulletin*, 1948, v. 45, 787] were therefore used. The authors came to the conclusion that the strain of amoeba employed did not consume glucose, a finding which may be at variance with that of NAKAMURA *et al.* [this *Bulletin*, 1953, v. 50, 708] who reported the formation of acid and gas by *E. histolytica* in cultures containing glucose.

J. D. Fulton

DELAMATER, J. N., MICHAELSON, J. B., HALLMAN, Frances A. & BLUMENTHAL, H. **An Investigation into Hyaluronidase as a Factor in the Mechanism of Tissue Invasion by Endamoeba histolytica.** Amer. J. Trop. Med. & Hyg. 1954, Jan., v. 3, No. 1, 1-8. [14 refs.]

Because of its power to invade tissues, *E. histolytica* has sometimes been credited with the production of substances like the "spreading factors"

which have been described for certain bacteria. One such substance, hyaluronidase, possessing enzymic properties, is able to depolymerize the mucopolysaccharide hyaluronic acid which is of wide occurrence in animals as ground substance for connective tissues. The elaboration of such an enzyme by the parasite would enable it to penetrate animal connective tissues as in the case of schistosomes or hookworms.

The present authors have investigated the hyaluronidase-hyaluronic acid systems in *E. histolytica* in culture and *in vivo* studies in hamsters. Tests for production of hyaluronidase by the parasite under aerobic or anaerobic conditions, and its possible inhibition by bacterial metabolites were carried out. Evidence could not be found of its formation either intra- or extracellularly. No inhibitor of the enzyme was produced by the bacteria used in their laboratory. It was also found that formation of the enzyme was not induced when the appropriate substrate hyaluronic acid was added to the amoebic cultures. Turbidity tests were employed in assays for the presence of enzyme, and that from bacterial or testicular sources served as standard. The substrate was prepared by recognized methods from human umbilical cord.

In the *in vivo* studies young hamsters were inoculated intrahepatically [this *Bulletin*, 1951, v. 48, 1113] with various strains of *E. histolytica*, one of which produced a typical amoebic hepatitis, but amoebae isolated and cultured from the liver failed to produce hyaluronidase. The invasive character of various strains of amoebae was not altered by culturing them with different strains of bacteria.

J. D. Fulton

CHATGIDAKIS, C. B. **The Pathology of Hepatic Amoebiasis as seen on the Witwatersrand.** *South African J. Clin. Sci.* Cape Town. (Incorporating *Clin. Proc.*) 1953, Sept., v. 4, No. 3, 230-45, 6 pls. [21 refs.]

Between 1936 and 1950 some 9,500 autopsies were done in the Pathology Department of the Johannesburg Medical School; of the patients involved 4,494 were Bantu, 590 Coloured, and 4,416 European. The records show that 87 of them had amoebic abscesses of the liver and 1 amoebic hepatitis, an incidence of amoebic liver involvement of 1·6 per cent. in all the cases examined at post-mortem. Analysis shows the incidence of amoebiasis of the liver to be similar in Bantus and in Europeans; there was no significant difference in the sex incidence in either race. In the 87 cases of amoebic liver involvement amoebic intestinal lesions were noted in only 63. The types of development of amoebic infection of the liver are discussed in the light of the literature and are illustrated by a number of photomicrographs.

The complications secondary to the amoebic liver lesions in these cases were peritonitis in 27 (31 per cent.); pleuro-pulmonary lesions in 53 (61 per cent.); pericarditis in 10 (these included 4 cases where the liver abscess had penetrated into the pericardial sac); cerebral lesions in 5, splenic abscess in 1, and jaundice in 18 (20·7 per cent.) instances. In these cases with jaundice 10 had an acute generalized peritonitis, and 5 empyema, pyaemia or pericarditis; but in the other 3 no gross secondary complications were observed.

A. R. D. Adams

GRIDLEY, Mary F. **A Stain for *Endamoeba histolytica* in Tissue Sections.** *Amer. J. Clin. Path.* 1954, Feb., v. 24, No. 2, 243-4, 1 coloured fig.

The author, from the Armed Forces Institute of Pathology, Washington, has devised the following method of demonstrating erythrocytes in *E. histolytica* trophozoites in tissue sections.

Paraffin sections (6μ) are fixed to slides with Mayer's egg albumin, dried and brought up to distilled water through the usual stages. They are stained in Harris's haematoxylin (5 to 10 min.) or Weigert's iron haematoxylin (2 to 3 min.) and rinsed in water. Decolorization is then effected with 1 per cent. HCl in 70 per cent. alcohol and the sections again rinsed in water. They are neutralized in dilute ammonia water (5 to 10 drops in 100 ml.), washed in running tap water and stained for 5 minutes in a solution consisting of eosin Y, 1.5 gm.; alcohol, 80 per cent., 100 ml.; aniline oil, 3.0 ml.; and glacial acetic acid, 1.0 ml.

After further rinsing in water, the sections should now be a deep rose colour.

The sections are next stained in a solution consisting of naphthol green B, 1.0 gm.; distilled water, 100 ml.; and glacial acetic acid, 1.0 gm. They are differentiated in 2 changes of 95 per cent. ethyl alcohol until the erythrocytes are seen to be a bright rose colour. Dehydration is achieved in 2 changes of absolute alcohol and the sections cleared in several changes of xylol and mounted in balsam. With this method, the amoebae are seen to be blue-green, their nuclei a deeper blue-green, the connective tissue green and the ingested erythrocytes deep rose. These appearances are clearly shown in a coloured photomicrograph. *H. J. O'D. Burke-Gaffney*

KOURI, P. & BASNUEVO, J. G. Amoebiasis des Rectums, des Anus und des Perineums. Ursachen von Fehldiagnosen, Ratschläge für Behandlung. [Amoebiasis of the Rectum, Anus and Perineum. Causes of Faulty Diagnosis and Suggestions for Treatment] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 46-51, 2 figs. [21 refs.]

The first case of cutaneous amoebiasis to be reported in Cuba was discovered in 1931 in the cancer hospital, where it was diagnosed primarily as cancer of the perineum. This provisional diagnosis was subsequently altered to that of actinomycosis.

The illustration depicts quite clearly the typical appearance of amoebic ulceration, and numerous *Entamoeba histolytica* were demonstrated in biopsy specimens, but apparently there was a time lag before they were discovered. The patient died of extreme cachexia 13 days after the application of deep X-ray therapy and pathological sections were examined 8 months later.

Subsequently other cases were recognized, but few details are given. The diagnosis of carcinoma appears to be common and in one instance the patient was rescued from a threatened ileostomy. In treatment a combination of chloroquine and diodoquin is recommended.

Philip Manson-Bahr

KNORR, R. Zur Behandlung der Amoebiasis mit Resotren. [Treatment of Amoebiasis with Resotren] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 51-3.

Knorr, working in Adis Ababa, finds "Resotren", a new chemical compound of yatren and resochin [chloroquine] useful in the treatment of amoebiasis. The proportions of either are not stated and the dosage is not given. It was tested out in 10 cases with satisfactory results. It acts on intestinal as well as on metastatic amoebiasis. Resotren is given by the mouth in doses of 40-60 tablets over a period of 15 days and it is fairly well tolerated. Four cases are reported, one with hepatitis and pleural effusion, but the details are meagre.

Philip Manson-Bahr

DONOSO INFANTE, A., AMENÁBAR, E., DEL SOLAR, V. & RAMÍREZ M., H. Nuevos medicamentos antiamebianos: glicolilarsanilato de bismuto y fumagillin. [New Drugs in the Treatment of Amoebiasis: Glycolylarsanilate of Bismuth and Fumagillin] *Rev. Med. Chile.* 1953, Aug., v. 81, No. 8, 493-6. [12 refs.]

None of the many drugs hitherto used has given certainty of cure of intestinal amoebiasis, so trial of new drugs still goes on. The 2 mentioned in the present paper are: Glycolylarsanilate of bismuth ("Wintodon") and fumagillin ("Amebacillin"). The former is a bismuth oxyderivative of p-N-glycolylarsenic acid, containing 15·01 per cent. of pentavalent arsenic and 41·8 per cent. of bismuth. It is not absorbed in the intestine so its action is limited to intestinal forms of the *Entamoeba*. The latter (fumagillin) is a crystalline substance isolated from a strain of *Aspergillus fumigatus* which is amoebicidal *in vitro* and *in vivo*.

The authors have treated 50 patients proved by faecal examination to be passing the entamoeba; 40 were given the arsenical, 36 in a dosage of 0·5 gm. thrice daily for 8 days and 4 were given 0·5 gm. 4 times a day for 12 days. Ten were given fumagillin in doses of 10 mgm. thrice daily for 3 days and 20 mgm. thrice daily for the following 12 days. Rectoscopy was performed on 47 patients; 27 showed amoebic scars, 19 a chronic atrophic rectitis, 12 a catarrhal rectitis, 3 had typical amoebic ulcers, 1 a non-specific ulceration [some must, therefore, have had a mixture of lesions], in 3 the mucosa appeared normal. Controls subsequent to treatment comprised, a week after the last dose, examination of spontaneous evacuations on each of 3 successive days; a fourth examination after a purgative; 25 had a fifth examination of the rectal mucus, the other 25 had 6 to 8 faecal examinations.

Of 37 patients with clinical symptoms 27 appeared to be cured and expressed themselves as being quite well; 8 said they felt a bit better ("la mejoría subjetiva parcial"), in 2 the treatment failed altogether. In 31 of the 40 treated with the "Wintodon" preparation, parasitological examination proved negative; in the other 9 fresh cysts and trophozoites of *E. histolytica* were seen; as the patients lived in an endemic area, it could not be determined whether these were re-infections or relapses.

Of the 10 treated with fumagillin 8 attained clinical and parasitological cure, 2 were unaffected.

In their summary the authors claim total disappearance of symptoms in 27, some of whom had proved refractory to previous methods of treatment. The more acute symptoms—congestion, oedema, small haemorrhages—were influenced favourably. Both drugs were well tolerated, except by one of those given fumagillin who complained of "intense anorexia" during the treatment. [Neither drug seems to have fulfilled the demands of an ideal treatment, but the authors rightly stress the fact that, as regards fumagillin, the number treated was too small for a conclusion to be of much value.] [For further references to fumagillin treatment, see this *Bulletin*, 1954, v. 51, 268.]

H. Harold Scott

MAEGRAITH, B. & HARINASUTA, C. Experimental Amoebiasis in the Guinea-pig. [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 582-3.

The authors describe the experimental production of amoebic liver abscesses in guinea-pigs. In uninfected animals abscesses appear regularly in the right liver lobe after injection of suspensions of cultivated *Entamoeba*

histolytica into the mesenteric and portal veins, but these abscesses recede about 4 days later. However, in guineapigs with an intestinal amoebic infection, liver abscesses produced in the same manner persist longer (10 or more days). The best results are obtained in guineapigs infected intra-caecally and treated with Diodoquin [di-iodohydroxyquinoline] before the intraportal injection of amoebae. Since the amoebae used in the experiments are accompanied by bacteria, the guineapigs have been treated with streptomycin and penicillin after intraportal inoculation of the amoebae. Some of the histological changes seen in the liver abscesses are attributed to the concomitant bacteria. It is suggested that amoebic liver abscesses of the pattern observed in man might probably be produced experimentally when bacteria-free cultures of *E. histolytica* are obtainable. C. A. Hoare

ANDERSON, H. H. & CHANG, Y. T. **The Amebacidal Activity and Pathologic Effects of Yatanoside.** Reprinted from *Stanford Med. Bull.* 1953, Feb., v. 11, No. 1, 41-3.

The seeds of *Brucea sumatrana* which is also known by other names has long been used in the treatment of dysentery. CHANG [this *Bulletin*, 1951, v. 48, 894] isolated a crystalline bitter principle named yatanoside from the kernel and carried out tests *in vitro* and *in vivo* against *E. histolytica*. Similar experiments *in vitro* and in four *Macacus philippensis* monkeys naturally infected with *E. histolytica* are described here. The techniques used have been described before [this *Bulletin*, 1947, v. 44, 819]. The tests were made *in vitro* with monophasic and diphasic media with amoebae grown in presence of bacterium "t". The drug was dissolved in water or propylene glycol and cultures were examined after 48 hours' incubation at 37°C. and subcultures made if growth was absent. Suitable controls and standards were present including tubes with emetine hydrochloride. Prior to toxicity studies the electrocardiograms, liver and renal function of the monkeys used were found to be normal.

The drug was given in 0·2 per cent. solution in saline subcutaneously in total doses ranging from 12 to 30 mgm. per kgm. in a course of injections over a period up to 3 weeks. It was found that in egg-slope medium and liquid medium yatanoside had half and one-tenth the activity of emetine respectively. A total dose of 16 mgm. per kgm. given during 5 days was effective in the treatment of one monkey, but other dosage schedules produced only a temporary effect. The number of animals was too small to give significant results. Various toxic symptoms occurred in mice and monkeys, and post-mortem examinations indicated congestion in a number of organs, fatty degeneration of the liver and myeloid hyperplasia of the spleen.

J. D. Fulton

NEAL, R. A. **Studies on the Morphology and Biology of Entamoeba moshkovskii Tshalaia, 1941.** *Parasitology.* 1953, Nov., v. 43, Nos. 3/4, 253-68, 43 figs. [30 refs.]

Following the discovery of the free-living *Entamoeba moshkovskii* in Russia [this *Bulletin*, 1943, v. 40, 311] and its subsequent finding in Brazil (AMARAL and LEAL: *Rev. Paulist. Med.*, 1949, v. 34, 173), it was recovered by the present author from a sewage plant in London. Samples of sewage inoculated in culture media gave rise to mixed protozoal populations, from which *E. moshkovskii* was isolated by incubating the cultures at 37°C. or treating them with HCl, after which this amoeba was grown in "pure" culture with the concomitant bacteria. *E. moshkovskii* proved to be an

anaerobe, the optimum conditions for its growth in culture being at 24°C. A detailed description is given of the morphology and life-cycle of this entamoeba, the trophozoites, cysts and stages of metacystic development of which are in general like those of *E. histolytica*. *In vitro* experiments have shown that in a fluid medium the cysts will survive up to 10 months at 4°C., but they cannot withstand desiccation.

In view of the close resemblance of *E. moshkovskii* to *E. histolytica* and other *Entamoebae* producing quadrinucleate cysts, experiments were carried out in order to ascertain whether the sewage amoeba was infective to animals. It was found that in rats inoculated intracaeally *E. moshkovskii* merely survived up to 5 days, after which they died out, whereas no infection whatever could be produced in these animals after oral administration of cysts. Likewise attempts to infect "clean" larvae of frogs and salamanders, by feeding them with material containing cysts, failed. From the negative results with rats—and taking into consideration the failure of other workers to infect kittens and guineapigs—it is concluded that "it does not seem likely that *E. moshkovskii* will infect man". Since in sewage plants this amoeba finds itself in a *cul-de-sac*, it is thought that it occurs naturally in other habitats as well.

This paper is accompanied by numerous figures illustrating the morphology and all stages of development of *E. moshkovskii*.

C. A. Hoare

VAN STEENIS, P. B. **Giardiasis.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Dec., v. 5, No. 4, 371-8. [13 refs.]

The stools of 3,289 persons returning to the Netherlands from Indonesia between 1946 and 1952 were searched for *Giardia intestinalis* infection. It was found in 61 (1·9 per cent.) of these people. This low figure of incidence may be due to the fact that many of them had taken mepacrine for the prophylaxis or treatment of malaria. *Giardia* infection also occurs autochthonously in the Netherlands.

The symptoms ascribed by the author to the infection are analysed; abdominal pain was the most common, but it occurred in only 23 of the 61 patients; looseness of the bowel was noted in only 14 of them; no serious ill health was attributed to the infection. Nevertheless the author considers that a *Giardia* infection is pathogenic and he gives some [rather nebulous] reasons for his belief. The infection should be eradicated, when detected, by treatment with mepacrine; for an adult the dose is 300 mgm. daily for 5 days to achieve this end.

A. R. D. Adams

JELÍNEK, M., ŠETKA, J. & VOŠTA, J. Lambliasa s horečnatým průběhem.
[**Giardiasis With a Febrile Course**] *Casopis Lékařů Českých*. Prague.
1954, Feb. 12, v. 93, No. 7, 166-71. [13 refs.]

The English summary appended to the paper is as follows:—

"A case of Giardiasis intestinalis in a 17 years old male is described. The condition manifested itself by an unusual clinical picture, long standing febrility which followed a non specific infection of respiratory tract."

FORSYTH, D. M. **Balantidiasis.** [Correspondence.] *Lancet*. 1954, Mar. 20, 628-9.

Balantidiasis does not seem to have been recorded from the Persian Gulf hitherto, but the author, in Kuwait, has seen the parasite in the stools of

7 patients in over 20,000 consecutive examinations. All patients were male Moslem Iranis having no contact with pigs.

Six patients were treated with aureomycin, 500 mgm. twice daily for 10 days. Five of them originally showed blood and mucus in the stools and in 3 ulceration of the colon was seen with the sigmoidoscope.

Relief from symptoms was prompt and the parasite disappeared rapidly from the stools. The bowel ulcers healed in 10 days and no relapse has been seen in a follow-up period of 6 weeks to 6 months. There were no unpleasant side-effects. [For other work on aureomycin in this condition, see this *Bulletin*, 1952, v. 49, 868, 1123.] *H. J. O'D. Burke-Gaffney*

WATTLEY, G. H. The Treatment of Stovarsol-Resistant Balantidiasis with Aureomycin. (A Case Report.) Caribbean Med. J. 1953, v. 15, Nos. 3-4, 92-4.

"A case of *Balantidium coli* dysentery is reported.

"The disease has not previously been recorded from Trinidad.

"The condition was refractory to treatment with Stovarsol, but was apparently cured by a course of 10 grams of Aureomycin."

RELAPSING FEVER AND OTHER SPIROCHAETOSIS

VAISMAN, A. & HAMELIN, A. Immunité et spécificité des immobilisines récurrentielles entre *Borrelia duttoni* et *Borrelia hispanica*. [Immunity and Specificity between the Immobilizing Antibodies of *Spirochaeta duttoni* and *Spirochaeta hispanica*] Ann. Inst. Pasteur. 1954, Jan., v. 86, No. 1, 107-9.

The authors found that mice 3 months after inoculation with either *Spirochaeta duttoni* or *Spirochaeta hispanica*, were refractory to a new inoculation with homologous strains, but were fully susceptible to inoculation with heterologous strains. The study was made by means of the immobilization test, which the authors have already used [this *Bulletin*, 1953, v. 50, 941] in similar investigations. [This cross-immunity method of distinguishing strains of relapsing fever spirochaetes has been used for at least 40 years and this is merely another example of its application.]

Edward Hindle

MOOSER, H. & WEYER, F. Künstliche Infektion von Läusen mit *Borrelia duttoni*. [Experimental Infection of Lice with *Sp. duttoni*] Ztschr. f. Tropenmed. u. Parasit. Stuttgart. 1954, Jan., v. 5, No. 1, 28-45, 6 figs. [Numerous refs.]

The English summary appended to the paper is as follows:—

"1. *Pediculus vestimenti* was infected with three strains of *B. duttoni* either by feeding on mice or by rectal or intracelomic inoculation with the blood of mice.

"2. Whereas intracelomic inoculation was followed in each instance by an abundant multiplication of the spirochetes in the hemolymph, the celoma was not regularly invaded by those spirochetes which had entered the lice through feeding or by rectal inoculation."

" 3. After intracelomic inoculation spirochetal growth was so vigorous that already within a few days the celomic fluid was teeming with spirochetes.

" 4. In some of the rectally inoculated lice spirochetes were found already 24 hours later in the hemolymph where their progressive accumulation could be followed day by day by the examination of the tiny drop of fluid which protrudes from the stump of an amputated leg. There was no indication of a special cycle of development which goes through a granular phase, irrespective of the way by which the spirochetes had entered the celoma. No spirochetes could be found in the organs of the lice nor in the ova. Their presence was restricted to the hemolymph.

" 5. The infection had no deleterious effect on the lice. One of the three strains was kept going by exclusive louse to louse transfers during eight months mostly by intracelomic inoculation. Aseptically obtained hemolymph was used for the transfers. When put back into mice after the twenty-first louse transfer the strain behaved still like the original strain with respect to its immunologic properties as well as its infectivity for *O. moubara*."

HEISCH, R. B. **The Host of *Ornithodoros graingeri* Heisch and Guggisberg, 1952.** *East African Med. J.* 1954, Jan., v. 31, No. 1, 29.

The author adds to his previous observations [this *Bulletin*, 1953, v. 50, 466, (772)] the finding that 9 of 10 blood meals of *O. graingeri* from the caves near Mombasa reacted to porcupine antiserum. The tenth feed was positive for human blood, probably because the tick fed on one of the collectors: it feeds readily on man. Larvae were once found on a cave-haunting bat, *Nycteris capensis*. The tick is therefore not markedly host specific. It is not yet known whether porcupines occupying the caves are infected with *Sp. graingeri*. This spirochaete may persist for long periods in man after experimental inoculation, and it may be that man was once the host.

H. J. O'D. Burke-Gaffney

ITO, T. & SAITO, M. **Studies on the Scrotal Reaction due to Rat-Bite Fever Spirochete.** *Acta Med. et Biologica. Niigata.* 1953, Mar., v. 1, No. 1, 23-8, 3 figs.

The scrotal lesions produced in guineapigs after inoculation with *Rickettsia typhi* [*R. mooseri*] constitute one of the reactions by which this organism is distinguished from *R. prowazeki*. During the course of a study of endemic typhus in the city of Niigata, the authors inoculated guineapigs intraperitoneally with the brain emulsions of wild rats and obtained scrotal reactions indistinguishable from those produced by *R. mooseri*. The examination of smears from the tunica vaginalis, however, revealed only the causative organism of rat-bite fever and the smears were negative for rickettsiae. Three examinations of wild rats by this method in different years gave positive results for rat-bite fever in 3 out of 28, 2 out of 51, and 2 out of 13 guineapigs, respectively.

Serial intraperitoneal subinoculations into male guineapigs invariably produced the same scrotal reaction, accompanied by rise in temperature, decrease in body weight, watery discharge from the nose, diarrhoea, loss of hair and other symptoms characteristic of the disease. The intratesticular inoculation shortened the incubation period before the appearance of the reaction from 6-8 days to 4-6 days in the case of one series of experiments.

The strain was also used to infect mice and the spirillum was found to

persist in the blood and peritoneal fluid but without producing clinical symptoms. Guineapigs inoculated with the blood of these infected mice all showed the same scrotal lesions, which would seem to be a characteristic of infection with *Spirillum minus* var. *morsus muris*. *Edward Hindle*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

LEPROSY IN INDIA. 1954, Jan., v. 26, No. 1, 23-37. VI. International Congress of Leprosy: Draft Report of Technical Committees.

In an editorial the VI International Congress on leprology is shortly described. This was held in Madrid in October 1953. The next Congress is to be held in India in 1958. With this in view some of the difficulties connected with the holding of international congresses are described so that they may be avoided on future occasions. Much of the work of the Congress was entrusted to 5 technical committees, on Classification, Immunology, Treatment, Epidemiology and Control, and on Social Assistance. The reports of these committees were accepted with a few modifications by the Congress. Regarding Classification, which has been the most vexed problem for many years, a fairly satisfactory agreement was arrived at, supplying, as it does, a broad practical working classification, suitable for the general practitioner and for those specialists working "in the wilderness" where there are not facilities for detailed laboratory examinations, and a more particularized formula for those who have these facilities. The 4 main primary divisions are lepromatous, tuberculoid, indeterminate and borderline. The first of these types is divided clinically into macular, diffuse, infiltrated, nodular and neuritic groups. The tuberculoid is subdivided into macular, minor, major, and neuritic groups. The indeterminate may be macular or neuritic.

The report on Immunity first defines the lepromin test, the antigen, and the reading and interpretation of the reactions. Regarding BCG, it is acknowledged that the lepromin reaction, when positive in healthy people, frequently indicates a state of resistance to *Myco. leprae*; that in leprosy patients a positive reaction indicates a favourable prognosis; that artificial conversion of the reaction takes place in a proportion of cases; that administration of BCG to healthy people with a negative lepromin converts the lepromin reaction to positive in a certain proportion of cases; that oral administration of BCG in the usual doses is free from risk even to allergic persons, but whether a positive lepromin reaction induced in this way is an indication of increased resistance is not yet conclusive. The Committee recommend intensive trials to clear up the value of this vaccine, and to find other procedures equally capable of converting the lepromin reaction.

Under Treatment, the chief emphasis is on sulphones, and, because of its cheapness and ease of administration, on DDS as the treatment of choice. Protracted after-treatment of arrested cases is recommended when practicable. Chaulmoogra oil and its derivatives are abandoned by nearly all workers, but a few use it in combination with sulphones. Thiosemicarbazones are recommended as an alternative to sulphones when the latter

are not tolerated. Isoniazid was considered by nearly all workers to have little beneficial effect in human leprosy. ACTH and cortisone, in spite of their immediate striking effects in lepra reaction, provoked a divided opinion, some workers getting continued good results with small doses, and others finding that their cessation was followed by acute manifestations of leprosy and by increase in underlying disease. Cortisone is useful in eye drops or subconjunctivally in acute eye conditions. The use of streptomycin should be guarded, though some have found it useful in the acute manifestations of leprosy.

Under Epidemiology and Control, it was emphasized that the latter should be based on the results of the former. Among the measures recommended for control are: BCG vaccination; close observation of lepromin-negative contacts; out-patient treatment of all but the more infectious cases; selective segregation of infectious cases long enough to get clinical regression and bacteriological negativization; scientific investigation; and social assistance to patients and dependants when necessary.

The Social Assistance Committee recommended steps for rehabilitation: useful employment of patients according to their ability, as little interference as possible with the normal lives and occupations of patients, government assistance to dependent families, and special care of patients with disabilities. They also recommended that existing laws regarding leprosy should be brought up to date.

Ernest Muir

ARNOLD, Harry L., Jr. [M.D., F.A.C.P.] **Modern Concepts of Leprosy.** pp. ix + 105, 33 figs. 1953. Springfield: Charles C. Thomas, 301-327 East Lawrence Avenue, Illinois, U.S.A. Oxford: Blackwell Scientific Publications Ltd. [27s. 6d.]

This monograph is written by a dermatologist and is intended primarily for dermatologists, and to supplement the very scanty and often out of date information given in general text-books. After a short introduction dealing with the most common misconceptions, and a short but adequate note of 2 pages on aetiology, the author describes the epidemiology under age, sex, race, opportunity for contagion, geographical location, diet, insect vectors (unproved), climate, tuberculosis, and inherited susceptibility, giving a brief but clear picture. Classification is dealt with up to, but not beyond, the findings of the international congress in 1948. An excellent chapter on diagnosis is well illustrated and contains a table with the various characteristics of the three types of leprosy. This is followed by two larger chapters dealing respectively with the lepromatous and the tuberculoid types. In this connexion figures 14 and 31 are of particular value. The former bears the legend "Lepromatous leprosy of the ulnar nerve, sectioned at the elbow; normal nerve below for comparison. Note thickening of all components of the nerve, the result of perineurial proliferation, resulting in only moderate enlargement, but marked increase in tightness, compactness and stiffness, of the nerve". Fig. 31 shows a section of the great auricular nerve; "note complete obliteration of nerve architecture by the sarcoid-like granulomatous infiltrate, and areas of caseation necrosis, which are common in nerves but rare in skin lesions".

Treatment is condensed into 5 pages, and readers are referred to larger works for further details. A comparison is made between leprosy and syphilis in that there has been a return from the more complicated derivatives of 4,4' diaminodiphenyl sulphone to the simpler parent drug, as occurred in the chemotherapy of syphilis with a return to oxyphenarsine hydrochloride.

Under Prevention, reference is made to the recent promising experiments in raising the resistance of contacts and especially children, by vaccination with BCG. After discussing various opinions on the value of prophylaxis by isolation, the author concludes that "For the present, at least, and until more evidence is available regarding the epidemiologic principles which are involved, it seems unwise to abandon restrictions on the movements and associations of 'open' (*i.e.*, bacteriologically positive) cases of leprosy. Their contact with other persons, especially their blood relatives—in whom the evidence for susceptibility to infection is far more striking than in tuberculosis, for example—should be prevented until they have been rendered bacteriologically negative by treatment, at least in those parts of the world where leprosy is endemic".

The book is clearly and interestingly written, well illustrated with 33 photographs and photomicrographs, and beautifully printed and bound. It should find its way to the bookshelf not only of the dermatologist but also of the general practitioner who in these days of wide and easy travel may any day be confronted with a case of leprosy.

Ernest Muir

LITTANN, K. E. Die medizinische Kartographie der Lepraverbreitung, ihre Aufgaben und Methodik. (Zugleich ein Beitrag zur medizinischen Kartographie chronischer Infektionskrankheiten.) (Dem 6. Internationalen Lepra-Kongress, 3–11. Oktober 1953 in Madrid, in gekürzter englischer Übersetzung vorgelegt.) [**Medical Cartography of the Prevalence of Leprosy, its Problems and Method (together with a Contribution to its Use in Chronic Infective Diseases)**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 115–30, 4 maps. [18 refs.]

This article is at the same time too detailed and too diffuse to lend itself to abstract. In substance it deals with the use of maps (or, as the author calls it, "geomedical cartography") for recording the extent and control of leprosy and research in connexion therewith. In his view—and with this there will be general agreement—properly prepared maps will indicate the results of surveys of the prevalence of leprosy in particular, but analogously of other infective diseases, and by their greater accuracy will contribute to the formulation of preventive measures. Comparison of such mappings made at intervals will indicate the progress attained and any change of method of control called for. Such maps would include case-maps showing the distribution in a certain district; expansion maps, a name self-explanatory and indicating the increase or reduction of cases from time to time; type-maps showing, in the case of leprosy, the form of the disease; incidence maps of fresh or newly-discovered cases; immunity maps which would be of help in prognosis; maps of control stations, including clinics and treatment centres. All these are treated in considerable detail but it will be conceded that the whole is, in substance, axiomatic.

H. Harold Scott

HALMAGRAND, J. A propos de 24 lépreux en tribu et de leur traitement ambulatoire. [**Observations on 24 Leprous Patients living in their Tribes, and their Ambulatory Treatment**] *Maroc. Méd.* 1953, Aug., v. 32, No. 339, 772–5, 1 map & 1 fig.

In the area described, which is in the region of Fez, there is a population of 22,000, so that the 24 cases found make a leprosy rate of 1·1 per 1,000. Of the 24 cases found 6 were lepromatous, 6 tuberculoid and 9 indeterminate. Beginning with small oral doses of DDS the patients went on to weekly

injections of this drug. It was found that patients appreciated ambulatory weekly treatment, and the results were satisfactory. *Ernest Muir*

CORNIBERT. La lèpre dans le Moyen-Atlas. [**Leprosy in the Middle Atlas Region, Morocco**] *Maroc. Méd.* 1953, Aug., v. 32, No. 339, 775-6, 1 fig.

Contrary to what is generally supposed leprosy is not uncommon among the Berber tribesmen. The disease is generally found in several persons in one family. Of 52 cases found in 8 wandering tribes, 21 were lepromatous, 21 tuberculoid and 10 indeterminate. Of these 70 per cent. were men, 23 per cent. women, and 7 per cent. children (all boys); 12 per cent. were aged 20 or less, 54 per cent. from 21 to 40, and 38 per cent. from 41 to 60.

Ernest Muir

FIGUEREDO, N. **Leprosy amongst Children—a Social Problem.** *Indian J. of Child Health.* 1952, Nov., v. 1, No. 11, 575-80.

After a comment on the difficulties found in Bombay in obtaining permission to examine the child contacts of leprous patients, the "implications of a diagnosis of leprosy" are discussed. "There are many who say that neural cases negative to routine methods of examination ('closed') are non-infectious. Work in Bombay has shown that this opinion is untenable. Examination of all members' of families in which only neural cases existed revealed that 2 new neural cases were found among 33 contacts in 12 families in which only early neural cases existed . . . and that 18 new neural cases were detected among 113 contacts in 39 families in which only advanced neural cases existed. . . ." [Nothing is said as to what search was made to find out if there had been former contact with lepromatous cases now no longer present, or with "concealed" infectious cases, or with infectious cases outside the household. Also the word "neural" is not defined: this term, as adopted at the Cairo Congress in 1938, included indeterminate, reacting tuberculoid, and even borderline cases, all of which may show bacilli in greater or smaller numbers; and advanced lepromatous cases with marked deformities of the extremities are often included under the term. Without a clearer definition of terms, and description of the methods of examination used, the statements here made may lead to wrong conclusions.] The author goes on to emphasize the importance of the isolation of early child cases in institutions where they will be given training in useful occupations. "It is calculated that 15,000 children develop the disease annually" in India. *Ernest Muir*

QUAGLIATO, R. Incidência da lepra entre os comunicantes da Inspetoria Regional de Campinas. 18 anos de observação (1934-1952). [**Incidence of Leprosy among the Contacts at the Regional Campaign Inspectorate; 18 Years of Observation (1934-1952)**] *Rev. Brasileira Leprologia* S. Paulo. 1953, June, v. 21, No. 2, 133-42.

The campaign against leprosy in São Paulo began in 1928, and in 1934 records of patients and contacts began to be kept. Between then and 1953, 1,448 patients and 6,333 contacts have been registered, 6,000 of these forming the present study. Of the latter 95 (over 15 per thousand) have acquired the disease. A list of these patients is given with the dates of their first and last examinations and the duration of disease. The 6,000

were divided into 6 groups of 1,000 each according to the number of years they were under observation. In each of the groups the number who developed leprosy is given, the number of those with up to 6 years' leprosy contact and of those with more than 6 years' contact being noted.

Ernest Muir

RISI, J. B., FONTE, J. & ROSSAS, T. P. Reajustamento do trabalho anti-leprótico às determinantes atuais. [The Determinants in the Readjustment of Antileprosy Work] *Brasil-Médico*. 1953, May 16 & 30, v. 67, Nos. 20/22, 373-91. English summary.

The authors are dissatisfied with the results obtained so far in the anti-leprosy campaign in Brazil. In a table giving the number of cases per 1,000 of the population in each of 20 States for the 5 years up to 1950 there has been a steady increase, except in 3 where the number is the same. In some of the States the proportion of contagious cases has diminished, but in others it has increased. In the whole of the country the frequency per 1,000 has increased from 0.96 in 1946 to 1.17 in 1950. The importance of house infection is stressed; in 1,554 household contacts the infection rate was 39.8 per thousand; but in 7,848 non-contacts it was only 2.8. Of 13,072 patients found between 1946 and 1950, 70 per cent. presented themselves of their own accord, 20 per cent. were reported by ordinary notification, and less than 4 per cent. by direct specialized services. The chief difficulties so far have been want of money and of suitable staff. It is hoped in future to make more use of the general medical and public health services, and also of social welfare organizations. Chief stress is laid on early diagnosis by examination of contacts of known cases, early treatment, education and propaganda, protection in the home by sanitary education, and on the more extensive use of BCG as a prophylactic in lepromin-negative contacts.

Ernest Muir

SHIMIZU, Y. [Histological Study on the Differences between the Human and Murine Leprosy] *Osaka Daigaku Igaku Zassi*. 1953, Nov., v. 6, No. 2, 85-94, 12 figs. on 2 pls. [25 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"The human leprosy bacillus (Hansen 1871) and the murine leprosy bacillus (Stefansky 1902) present the similar morphology, and the histological findings due to these two bacilli resemble each other to some degree. But by more detailed studies, not so few differences can be revealed in the two diseases. The precise study in this field has not been carried out up to now. The comparison and correlations between these diseases were studied and the following results were obtained.

"1. The human leprosy bacillus has a strong affinity to the nervous system, but the murine leprosy bacillus has no tendency to involve the nervous system.

"2. The human bacillus carries out multiplication and symbiosis not only in the mesodermal but also ectodermal cells, but the murine bacillus only in the mesenchymal cells.

"3. In the human lepromatous lesion the specific findings are the inflammation of the vessel intima, the proliferation of the connective tissue and the round cell infiltration besides the lepra cells, while no such changes or a slight degree of them, even when they exist, are recognized in the murine lepromatous lesion.

" 4. The fatty degeneration is remarkable in the human lepra cells, but it is quite slight in the murine lepra cell. Consequently the vacuolization does not take place in the murine lepra cells as seen in the human lepra cells.

" 5. Many types of the giant cells are observed in the human leprosy, like Langhans' giant cells or those containing vacuoles or star-formed bodies, while in the murine leprosy only the type of Langhans' giant cells can be seen."

PLISSIER, M. & SECRET, E. La réaction d'hémagglutination de Middlebrook et Dubos chez trente-sept lépreux. [The Haemagglutination Reaction of Middlebrook and Dubos in Thirty-Seven Leprosy Patients] *Maroc Méd.* 1953, Aug., v. 32, No. 339, 779-83.

The authors confirm the findings of other French workers that this reaction is useful, not only in the diagnosis but particularly in the evaluation of progress under treatment of leprosy cases. [See also this *Bulletin*, 1953, v. 50, 33, 315.]

Ernest Muir

ROLLIER, R. & PELBOIS, F. Le test de Nelson dans la lèpre. Premiers résultats portant sur 41 malades. [The Nelson Immobilization Test in Leprosy. The First Results in 41 Patients] *Maroc Méd.* 1953, Aug., v. 32, No. 339, 777-8.

This article is written to show that the Nelson treponema immobilization test is of value in showing up false positives in leprosy when cases of this disease are tested by the standard serological tests for syphilis. In tabular form comparisons are given of results obtained with Kolmer, Kahn, Meinicke, VDRL and Nelson tests in 41 cases. The Nelson test should be of particular use in Casablanca, where the term "nouar" (syphilis) is applied to almost every form of ulcer: it is not, however, available for current use.

Ernest Muir

COSSEMERELLI, W. & DA SILVA, R. P. Ionisação da acetil-beta-metil-colina (mecholil) nas lesões tegumentares de lepra. [Ionization with Acetyl Betamethyl Choline (Mecholyl) in the Skin Lesions of Leprosy] *Rev. Brasileira Leprologia*. S. Paulo. 1953, June, v. 21, No. 2, 89-132, 21 figs. [25 refs.]

This substance had previously been used by ARNOLD [this *Bulletin*, 1949, v. 46, 478] who injected a solution intradermally in doubtful cases of leprosy. The authors used Mecholyl in a 3 or 5 per cent. solution, obtaining penetration of the skin by means of a galvanic current varying in strength according to the area of the skin covered by the pad of the electron (0.1 milliampères per square centimetre). In the normal skin there was profuse sweating in the covered area within 2 minutes, and also erythema and formication. Trials were made on 101 cases, 61 of them being of leprosy, 17 normal, 17 neurological, and 6 with various skin conditions. In some cases owing to scleroderma and other causes there was defective entrance of the drug. In the neurological cases the results varied according to the type of cases, producing hyperhidrosis, hypodrosis, anidrosis or normal results. In the leprosy cases the results varied with the type of the disease, the length of treatment and other factors.

The authors consider that the test is useful not only in differential diagnosis of leprosy, but also in estimating improvement under treatment. The technique is fully described, and the apparatus used and the results obtained are well illustrated in several figures. There is also a description of the anatomy of the skin and particularly of the nerve-endings, at the beginning of the article.

Ernest Muir

SOUZA CAMPOS, N. Lesão tuberculóide secundária à lepromino-reação. [**Tuberculoid Lesion Secondary to the Lepromin Reaction**] *Rev. Brasileira Leprologia*. S. Paulo. 1953, June, v. 21, No. 2, 143-6, 3 figs.

VEDAMUTHU, I. **Therapeutic Uses of Sulphetrone.** *Leprosy in India*. 1954, Jan., v. 26, No. 1, 13-15.

The author found a 10 per cent. solution of sulphetrone useful when injected subcutaneously along the course of thickened nerves. Similar injections along the median and ulnar nerves alternatively were followed by relief of wrist-drop (although this condition is due to affection of the radial nerve). A 5 per cent. solution of Sulphetrone was found useful when injected subconjunctivally in certain eye conditions: keratitis, corneal infiltrations, iridocyclitis. Co-existing filarial swellings were reduced by the administration of sulphones.

Ernest Muir

ROY, A. T. **Thiosemicarbazone in Leprosy.** *Leprosy in India*. 1954, Jan., v. 26, No. 1, 9-13.

The effects of treatment with thiosemicarbazone on 9 patients for an average of 23.5 months are described. No toxic symptoms or lepra reaction were observed before 6 months of treatment with 150 mgm. daily doses. No agranulocytosis was observed. Pain, dermatitis, burning sensation were less than with DDS. Improvement was in no way less than with DDS. It was specially good for the patients who could not tolerate DDS.

Ernest Muir

SECRET, E. Soixante-deux cas de lèpre traités par l'isoniazide. [**Sixty-two Cases of Leprosy Treated with Isoniazid**] *Maroc Méd.* 1953, Aug., v. 32, No. 339, 758-62, 8 figs.

This is one of a series of articles forming a special number of *Maroc Médical* on leprosy. An account is given of the treatment of 62 cases of leprosy with isoniazid. Most of them were of long standing. Of the 62 there were 43 lepromatous and 19 tuberculoid or indeterminate. The daily dosage was 50 mgm. per 12 kgm. of weight. The dose was divided and given 3 times a day after meals for 3 weeks, followed by a week's rest. After 3 months there was a month's rest. With one or two exceptions the only incidents were slight erythematous reactions without fever. The results are described after 15 months' treatment. Clinically there was improvement, but bacteriological examinations were not always made, and when they were, nasal mucus only was examined. The author considers that the results are sufficiently good to let this drug be included with sulphones in the campaign against leprosy.

Ernest Muir

FLOCH, H. & SUREAU, P. Résultats d'essais de traitement de la lèpre par l'I.N.H. [Results of Experimental Treatment of Leprosy with Isoniazid] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini.* Publication No. 292. 1953, Aug., 10 pp.

The author has treated 23 leprosy patients for periods of 2 to 15 months with daily doses of 300 to 500 mgm. of isoniazid. Except in one patient, who made remarkable clinical and bacteriological improvement within 11 months, this drug did not prove itself of much real value. There was some clinical improvement in some lepromatous cases, but this did not carry corresponding bacteriological amelioration. There was some reason for hope that a combination of DDS and isoniazid would give better tolerance and avoid the danger of drug resistance, but no ground for such hope is given. Isoniazid does not appear to prevent reactions.

Ernest Muir

BRAND, P. W. **The Place of Physical Medicine and Orthopaedic Surgery in Leprosy.** *Leprosy Review.* 1954, Jan., v. 25, No. 1, 5-10.

THOMAS, Ruth E. **An Investigation into Paralysis Patterns in the Forearm and Hand in Leprosy.** *Ibid.*, 11-15.

— — —. **Physiotherapy and Neural Involvement in Leprosy.** *Ibid.*, 16-36, 15 figs. [15 refs.]

— — —. **Suggestions for Treatment by Physical Methods in Neural Leprosy.** *Ibid.*, 37-41, 9 figs.

This special Physiotherapy Number contains 4 papers, one of them by Paul BRAND and three by Sister Ruth THOMAS. These 2 workers have been co-operating for some years as the orthopaedic surgeon and the sister in charge of physiotherapeutics in connexion with leprosy, at the Christian Medical College, Vellore.

The surgeon and physical therapist have 3 important objectives: the prevention of deformity, the correction of deformity when it has occurred, and the rehabilitation of the crippled patient. Causes of deformity of the hand are divided into 3 groups associated with paralysis of the motor and of the sensory nerves, and the direct attack of the infection on the tissues of the hand. These cause (a) limitation of movement and stiffness of the joints, and (b) absorption and destruction of the fingers. Anaesthesia removes the safeguard of pain and temperature sensation, and thus lays the patient open to all kinds of injuries which are the chief causes of finger-absorption. Motor paralysis protects from such injuries when it occurs early, as the fingers become bent up into the palm of the hand and are thus kept out of the way of danger. The great preventive is carefully selected occupation, and instruction of the patient in detail how to use and protect his hands both in work and in cooking and eating. In the majority of neural cases it should be possible to keep the hands intact and active to the end of the patients' lives even though they may have some disability from paralysis.

When deformities have occurred, physiotherapy should precede surgery, so that the maximum motility of joints may be achieved before operation. If the fingers cannot be pulled open wider than a right angle, the hand is probably not suitable for tendon-transplantation. The importance of rehabilitation is emphasized; this should begin along with the patient's treatment for leprosy, and continue till he is again settled in his home environment. At the Vellore rehabilitation centre patients are trained in various handicrafts with which they are able to support themselves when they return home.

The first of Sister Thomas's papers deals with the patterns of paralysis in the forearm and hand, in the muscles supplied by the ulnar, the median below and above the wrist, and the posterior interosseous nerves. These are graded according as they show partial or absolute reaction of degeneration. In an editorial Mr. James of the Royal National Orthopaedic Hospital mentions the difficulty of assessing accurately the strength of muscles by the electrical reactions as used by Miss Thomas, and recommends the use of the now generally accepted MRC method of grading voluntary power. The progress of paralysis is often not continuous, but may show periods of improvement and retrogression, the causes of which require further study.

Miss Thomas's second paper covers physiotherapy. "The loss of even a part of the 20 small muscles of the hand may cause a serious imbalance in the hand which greatly reduces its usefulness." Of great importance is the mental state of the patient who has lost his job owing to the condition of his hands. "The main aim, therefore, is to win the confidence and co-operation of these people, and try to help them to help themselves." The treatment used consists of oil massage, wax therapy which increases the heat and circulation of the parts, electrical stimulation, and, most important of all, exercises. These latter are very clearly described in detail and should be studied in the original. Indiscriminate splinting is dangerous, and cases for splintage should be carefully selected. Improvement under treatment is estimated by the measurement of angles, the ranges of movement being tested when unassisted, assisted and passive. This paper is well illustrated with 15 photographs.

In the third paper physical methods are described, especially those of electrical stimulation.

Ernest Muir

ROGERS, L. Leprosy Incidence and Control in East Africa, 1924-1952, and the Outlook. *Leprosy Review.* 1954, Jan., v. 25, No. 1, 41-59.
[12 refs.]

The author once more outlines his method, first propounded in 1925, of controlling the incidence of leprosy, based upon the effective treatment of early cases with hydnocarpates and other suitable preparations. He then sketches in succession the measures used in 6 East and Central African countries: Uganda, Kenya, Tanganyika, Nyasaland, Southern Rhodesia, and Northern Rhodesia. This useful summary is followed by suggestions as to the lines along which further research should take place. A combination of hydnocarpus injections with sulphone treatment is particularly emphasized. "New large-scale leprosaria in East Africa are now available for such researches, any success in which hastens the time required to reduce greatly the incidence of leprosy in any country by methods now available. Great Britain is responsible for the largest number of leprosy patients of any country, only one-tenth of whom are as yet receiving the benefits of established treatment."

Ernest Muir

FLOCH, H. Evolution récente du problème de la lèpre. [Recent Development in the Problem of Leprosy] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini.* Publication No. 289. 1953, July, 12 pp.
[11 refs.]

A danger is foreseen, in the campaign against leprosy, that patients who have become bacteriologically negative, by the standard methods of examination, may again become positive and thus prove a danger in the spread of

the disease. Much more information is required, as we do not know whether the small residue of bacilli left in the body, and which still show acid-fast staining, are alive or not. Much emphasis should be placed on educating patients during their period of treatment, especially regarding their relationship and duty to society.

Ernest Muir

HELMINTHIASIS

*In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes*, other flukes); CESTODES (*Diphyllobothrium*, *Taenia*, *Echinococcus*, other cestodes); NEMATODES (*Hookworms*, *Ascaris*, *Filarial worms*, *Dracunculus*, etc., *Trichuris*, *Enterobius*, *Trichinella*, etc.).*

GILLET, J. Les schistosomiases humaines au Congo belge et au Ruanda-Urundi. [Human Schistosomiasis in the Belgian Congo and Ruanda-Urundi] *Inst. Roy. Colonial Belge Bull. des Séances*. 1953, v. 24, No. 4, 1323-34.

This paper has been drafted in connexion with a nosological map which is to be published in a general Atlas of the Belgian Congo.

It contains a brief description of the types of schistosomiasis prevailing in the areas concerned, their distribution, diagnosis, treatment and prevention. A valuable addendum is a list of prevalences among different communities in all the regions studied, shown in percentages with the year of record.

It is added that a full bibliography is attached to a report having the same title addressed to WHO.

Readers of this *Bulletin* will be familiar with the subject matter, but there is great value in having the statistics in a single paper.

SCHWETZ, J. Sur le problème bilharzien de Sakania (Katanga, Congo Belge). [The Schistosomiasis Problem in Sakania, Belgian Congo] *Ann. Soc. Belge de Méd. Trop.* 1953, Oct. 31, v. 33, No. 5, 463-82, 1 map & 3 figs. on pl.

The author's summary in French is freely translated as follows: The population of Sakania comprises about 1,200 Africans, of whom 626 adults and children (over 5 years of age) were examined. Two-thirds were found infected with urinary schistosomiasis and one-third with the intestinal form; the latter seemed to be of little importance, unlike the former in which about 50 per cent. of those positive had either blood in the urine or large numbers of eggs. Of the three groups of inhabitants, the Mission people, who are nearest to the river Lubembe, had the highest incidence of infection, and people of the railway headquarters, situated farthest from the river, had the lowest incidence. Intermediate between these two groups, both in incidence and in distance from the river, were the people of the town itself.

As the Lubembe is the only focus of *Planorbis* and *Physopsis* in Sakania, eradication of these snails seems well worth consideration. The river banks have low marshy vegetation and moreover the flow of water is very rapid, so that the use of molluscicides, without certain preliminary preparations, might fail utterly. The procedure to follow before treatment with molluscicides should be to clear the main river and to clear and drain its tributaries. We initiated this programme but did not expect the great difficulties involved and were obliged to leave Sakania without seeing the work completed. It is to be hoped that the Medical Service will find the means to carry out these control measures on the lines indicated and begun by us.

In an addendum to this paper the author describes the results of short

visits to two Salesian Missions, at Mokambo and Kipushia, situated 50 km. to the north and 107 km. to the south-west, respectively, of Sakania. Of 163 adults and children examined at Mokambo 45 per cent. were found infected with *S. haematobium* and 5 per cent. with *S. mansoni*. In the local streams *Physopsis* was plentiful and *Planorbis* rare. Of 137 people examined at Kipushia, of whom 91 were aged from 5 to 15 years, 35 per cent. were infected with *S. haematobium* and 10 per cent. with *S. mansoni*. *Physopsis* was again the commonest snail in the vicinity.

J. C. C. Buckley

EFFAT, S. Bilharzial Cor Pulmonale (Bilharzial Ayerza). *J. Egyptian Med. Ass.* 1953, v. 36, No. 11, 728-31.

The author recalls that in conjunction with Professor AZMY [this *Bulletin*, 1932, v. 29, 411] he originally described pulmonary arteriosclerosis due to schistosomiasis. Although many details of the pathology and of the radiology of the condition have since been elaborated, he considers that nothing of basic importance has been added to the original description of the condition given 20 years ago.

A. R. D. Adams

EL RAMLY, Z., SOROUR, A., EL SHERIF, A., LOUTFY, M. & IBRAHIM, M.
A Clinical and Haemodynamic Study of Cardio-Pulmonary Bilharziasis using the Technique of Cardiac Catheterisation. *J. Egyptian Med. Ass.* 1953, v. 36, No. 10, 567-86, 6 figs. on 3 pls.

This number of the *Journal* is devoted to papers read before the Egyptian Society of Cardiology.

After mention of the literature on the cardio-pulmonary changes consequent on schistosomiasis the authors in this paper recount the pathology of the lesions and their clinical and radiological features. They give an account of their own findings in 32 cases of pulmonary schistosomiasis which they have observed. Their many investigations included cardiac catheterization and withdrawal of samples of blood from different chambers of the heart and the pulmonary artery.

They divide their cases into three groups. The first group comprised 17 patients ranging from 10 to 32 years in age, all but one of whom were males. None of the members of this group made complaints related to the cardiovascular system, but they suffered from intestinal or urinary manifestations of schistosomiasis. There was enlargement of the spleen and of the liver in each case; there was no cyanosis; the heart was not enlarged and the heart sounds were normal; and the diagnosis of bilharzial cor pulmonale was made solely on the radiological appearances.

The second group comprised 15 patients of similar age distribution, of whom 3 were female. They complained of one or more of the following: cough sometimes with asthmatic paroxysms, haemoptysis or blood-staining of the sputum, breathlessness and palpitation on exertion, asthenia and giddiness, hoarseness and dysphagia, and oedema of the lower limbs. In all cases there was enlargement of the spleen and of the liver; cyanosis and clubbing of the fingers were seen in only one case. The heart apex was usually displaced outward, but the beat was not heaving; there was usually visible and palpable pulsation in the 2nd and 3rd, or the 2nd to the 4th interspaces; in all cases there was clinical evidence of right ventricular enlargement; in 6 of the 15 patients there were signs of congestive heart failure, and in one of these there was auricular fibrillation. The investigations showed that the chief change in this group of cases was a rise in the

pulmonary arterial pressure and a lesser rise in the right ventricular pressure, but a normal right auricular pressure. The cardiac output was normal.

The third group comprised 6 cases with clinical right heart failure; they had raised right pulmonary arterial, right ventricular, and also right auricular pressures. Only so long as the heart remained compensated did its output remain normal.

The details of some cases illustrative of the three groups are cited, and some X-ray photographs are reproduced.

A diagnosis of pulmonary schistosomiasis is made on clinical, radiological and electrocardiographic evidence; catheteric studies help to confirm the diagnosis and to differentiate it from other causes of pulmonary hypertension. Clinically, the absence of cyanosis, the rarity of finger clubbing and of auricular fibrillation, and the absence of clinical or radiological evidence of mitral stenosis, in conjunction with evidence of a schistosomal infection, are most helpful points in differential diagnosis.

A. R. D. Adams

EL SHERIF, A. The Electro-Cardiogram in Chronic Pulmonary Bilharziasis.

J. Egyptian Med. Ass. 1953, v. 36, No. 10, 587-600, 16 figs. on 8 pls.

This paper, like the preceding, was read before the Egyptian Society of Cardiology. It is concerned with the electrocardiographic changes observed by one of the same authors in 16 patients who suffered from pulmonary schistosomiasis and who could be placed in the categories indicated in the preceding paper. It describes in much more detail the electrocardiographic findings and there are reproductions of the recordings in selected cases. This paper should be consulted in the original by those interested in this aspect of the subject.

A. R. D. Adams

CAIRO: MINISTRY OF PUBLIC HEALTH. MEDICAL AFFAIRS. 8th Annual

Report Bilharzia Snail Destruction Section 1949-1950. 35 pp. 1953.

Cairo: Govt. Press.

The work of the snail destruction section continues on the same lines as previously. It is difficult to assess the progress made during the year reported because the period of the main survey was delayed a month as compared with the previous year and therefore higher infestation figures are recorded. Virtual control has been reported in the oases of the western desert but throughout most of the irrigated area the position appears to be much as it was last year.

Several matters are worthy of notice. During the year under review there has been a considerable increase in sulphation of canals in use as opposed to "closed" sulphation. A greater quantity of copper sulphate was made available and this permitted more intensive sulphation of heavily infested water courses and the treatment of greater lengths of canals and drains. In the Egyptian oases of the Libyan desert *Limnaea truncatula* has been found in addition to *L. cailliaudi*. Liver rot among cattle is widespread there and it has been decided to record the occurrence of both snail species and to attack both, although *L. truncatula* has not been incriminated as a vector in Egypt. For the first time a local joint committee has been formed in one province, representing the local irrigation, agricultural, rural health and snail control organizations. This coordination of bodies concerned with or affected by schistosomiasis is an important advance and it is to be hoped that the example will be followed in other parts of Egypt and elsewhere.

Certain errors were noted in the Tables. In one the 1950 figure of 5 per cent. of canals infested is compared with a 1949 figure of 6 per cent., which in the report for that year, however, appears as 4 per cent. Both figures are wrong, the correct percentage for 1949 being 5. A similar misquotation of the 1949 figure was noted elsewhere. Such inaccuracies, which may be numerous, raise some doubt as to the validity of the advances claimed.

The report, although claiming satisfactory results, demonstrates the great difficulty of control. The expenditure of a vast amount of labour and many hundreds of tons of copper sulphate has obviously not markedly reduced the extent of the problem even though its intensity may be lessened. Snail control alone, as practised in Egypt, appears an inadequate means of controlling the disease.

T. H. Davey

SCHWETZ, J. On Two Schistosomes of Wild Rodents of the Belgian Congo: *Schistosoma rodhaini* Brumpt, 1931; and *Schistosoma mansoni* var. *rodentorum* Schwetz, 1953; and their Relationship to *S. mansoni* of Man. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Jan., v. 48, No. 1, 89-100, 1 map, 1 fig. & 3 pls.

This paper is essentially a summary and review of our existing knowledge of *Schistosoma rodhaini* and of *S. mansoni* var. *rodentorum* and, with one exception, appears to contain no new information. The exception referred to is the statement that Dr. LE ROUX, to whom Professor Schwetz had sent living *S. mansoni* var. *rodentorum* material collected near Elisabethville, had succeeded in infecting laboratory-bred *Planorbis pfeifferi* kept in London with the miracidia hatched from this material, and laboratory mice with the resultant cercariae; while with the second generation of miracidia obtained from these mice he had again infected *P. pfeifferi*. LeRoux subsequently reported that the eggs recovered from the mice infected in England had retained the characters previously described by Schwetz when writing from Elisabethville. Further work on this interesting species is in progress and will be the subject of later reports. [It is of interest to note that females of *S. rodhaini* when fertilized by males of *S. mansoni* produce eggs whose shape " bears a close resemblance to eggs of *S. mansoni* var. *rodentorum*" (LE ROUX as reported in *Trans. Roy. Soc. Trop. Med. & Hyg.*, 1954, v. 48, No. 1, 4).]

R. M. Gordon

DA COSTA, O. R. Contribuição ao conhecimento da esquistossomose na Amazônia. [Contribution to our Knowledge of Schistosomiasis in Amazonia] *Rev. Serviço Especial de Saúde Pública*. Rio de Janeiro. 1952, Dec., v. 5, No. 2, 401-9, 1 folding map. [11 refs.] English summary.

Hitherto positive records of the presence of *Schistosoma mansoni* in Amazonia have been based on examinations of viscerotomy specimens of liver—no real proof that the infection was autochthonous. PARÁ, at the São Paulo Congress of 1948, reported finding ova of *S. mansoni* in livers from Acre, Guaporé, Rio Branco and the State of Amazonas, but the Public Health Service states that in "tens of thousands of faecal examinations in the States and Territories of Amazonia" not a single positive autochthonous case of infection has been seen, although *Tropicorbis centimetralis* is found in Belém. MACHADO and MARTINS in 1949 reported the first case of autochthonous infection in Itaituba, Pará State, Fordlandia [see this *Bulletin*, 1952, v. 49, 63] and MAROJA reported at the Ninth Brazilian Congress of Hygiene in November 1951, positive results in 72 of 202 persons

whose faeces were examined for the ova in the same district and 45 of them had never been out of Pará.

The author has examined carefully the faeces of 1,682 persons in the following 7 districts, all bordering on Fordlandia: Aveiro (189), Brasília Legal (285), Urussagui (48), Cury (153), Barreiras (156), Itaituba (620) and São Luiz (231). A comprehensive table of all these districts is presented and detailed tables of each of the 7 districts separately showing the actual numbers and the percentages of protozoal and helminthic parasites: *E. histolytica*, *E. coli*, *Endolimax nana*, *Iodamoeba bütschlii*, *Giardia intestinalis*, ankylostomes, *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis*, *Enterobius vermicularis*, *Balantidium coli*, *Trichomonas hominis* and *Schistosoma mansoni*. The last-named was found once each in São Luiz and Aveiro, 4 times in Itaituba, twice each in Urussagui and Barreiras but not in any of the others. The author concludes that "schistosomiasis mansoni in the Amazon region is possibly still restricted to Fordlandia, as the positive findings were all in immigrants. It is pointed out that this is the opportune and economical time to eradicate this parasitic disease before it spreads by means of migration from the endemic areas of the Brazilian Northeast".

H. Harold Scott

BARBOSA, F. S., DOBBIN, J. E., Jr. & COELHO, M. V. Infestaçāo natural de *Rattus rattus frugivorus* por *Schistosoma mansoni* em Pernambuco. [*Rattus rattus frugivorus* found infected in Nature by *Schistosoma mansoni* in Pernambuco] Publicações Avuls. Inst. Aggeu Magalhāes. Recife, Brazil. 1953, Oct. 29, v. 2, No. 4, 43-6. English summary (9 lines).

CAMERON in 1928 reported macaques in St. Kitts naturally infected with *Schistosoma mansoni* and suggested the possibility of there being other hosts [see this Bulletin, 1929, v. 26, 533] and KUNTZ in 1952 in Egypt found 3 gerbils infected [*ibid.*, 1952, v. 49, 1134] and RUIZ the same year found *Procyon cancrivorus* (the crab-eating raccoon) experimentally receptive [*ibid.*, 1954, v. 51, 193].

In a district of Pernambuco, Brazil, heavily infested with *Australorbis glabratus*, the authors collected in 12 days at the end of September and beginning of October 3,617 of these snails and found 10.5 per cent. of them infected; in some groups collected the infection rate was as high as 50 per cent. They next caught rats (*Rattus rattus frugivorus*) in 3 localities; of 6 caught in one place 4 were infected with *S. mansoni*; of 15 in another 6 were positive, as were all of 6 caught in the third locality; altogether 16 of the 27 captured were positive. This rodent is very common in rural parts of Brazil and is closely associated with man; it must, therefore, be seriously considered as a source of human infection.

H. Harold Scott

PESSÔA, S. B. & COUTINHO, J. O. Contribuição ao estudo do sangue na esquistossomose mansônica. I. Anemia. *Folia Clin. et Biol.* S. Paulo. 1952, Dec., v. 18, No. 3, 189-97. II. Fórmula leucocitária. *Ibid.*, 199-205. III. Eosinofilia pós-terapeútica. *Ibid.*, 207-13, 2 graphs. [**Study of the Blood in Infection by *Schistosoma mansoni*.** I. **Anaemia.** II. **Leucocytic Formula.** III. **Post-treatment Eosinophilia**]

This study has been carried out on 210 persons, male and female, white and coloured, aged 6 to 60 years, all infected by *S. mansoni* in various stages, proved by finding the ova in the faeces.

I. *Anaemia.* For this, the haemoglobin was estimated by Fischer's photoelectric colorimeter; the sedimentation rate by Westergren's method, reading after an hour, red and white cell counts by Wintrobe's technique.

The patients were divided into 5 types [really 4, because of one group—acute cases—none was seen]: type I, with intestinal symptoms (44 cases); type II, with hepatomegaly (72); type III, with compensated cirrhosis of liver and spleen (62); type IV, with uncompensated cirrhosis (32). Detailed results are given in a series of tables which may be epitomized as follows: in all groups the anaemia tends to the hypochromic macrocytic type, thus in type I, 8 had normocytic cells, "the remaining 32 macrocytic" [these would account for 40 only of the 44 in this group]; type II, 8 normocytic, 64 macrocytic; type III 6 normocytic, 1 microcytic, 55 macrocytic; type IV, 2 normocytic, 3 microcytic, 27 macrocytic; haemoglobin 11.3, 10.6, 10.0 and 8.6 gm. per cent. respectively in types I to IV; red corpuscles 3,938,000, 3,634,000, 3,555,000 and 2,994,000 per cmm. respectively; erythrocyte sedimentation rate (in one hour) 16.5 mm. in type I, and then increasing with evolution of the disease, 28.0, 36.6 and 78.1 mm. in types II, III and IV respectively. No appreciable differences were observed regarding colour, sex or age of the patients, nor in those with hookworm and those without. Although hookworm anaemia is of the microcytic hypochromic type, in the presence of schistosomiasis the macrocytic hypochromic type is maintained.

Treatment tends to restore the normocytosis, and the sedimentation rate after treatment was 23.0 mm. (average); in those not treated it was 28.5 mm.

II. *Leucocytes.* These were generally reduced in total, but nevertheless the averages in all types remained within the limits of the normal, though the minima were below and the maxima above in all types. Thus, type I averaged 6,902 per cmm. (2,400 minimum, 13,700 maximum); type II, 6,251 (2,700 and 17,000); type III, 5,550 (2,700 and 15,300); type IV, 4,212 (1,300 and 12,100). Neutrophiles, though reduced absolutely, showed little relative reduction, constituting 52.4 per cent. in type I and 63.2 per cent. in type IV; eosinophiles were increased absolutely and relatively, but fell somewhat in type IV, the percentages being 18.3, 21.3, 18.6 and 16.9 in the 4 types respectively. The eosinophilia was greater in those infected with hookworm also. In a few it was very high; in one 56 per cent., in another 68 per cent. Lymphocytes and large mononuclears did not show any marked differences in their relative counts.

III. *Eosinophilia after Treatment.* Increase in the normal number and relative percentage of eosinophilia is common knowledge in helminthic infections; less well known is the fact that there is often a further increase after treatment, at all events in schistosomiasis, and that this increase is not only an indication of the parasitic activity of the drug but also of its therapeutic potency. MACIEL in 1924 (*Arch. Inst. Vital Brasil*, v. 2, 105-119) called attention to the rise in eosinophiles after treatment of schistosomiasis with tartar emetic, and others have since reported the same.

The present authors record their observations in Aracajú, Sergipe, on 58 persons treated with 3 antimonials and with Miracil D. Twenty-six were treated with the trivalent Fuadin; the eosinophilia was increased in 16, unchanged in 4, reduced in 6; the average before treatment was 24.5 per cent., after treatment 34.2 per cent. Ten were given the pentavalent Solustibosan; the average before treatment was 18.8 per cent., after treatment 20.8 per cent. The pentavalent Glucantime was less active as an anthelmintic; it was tried on 8 patients and the eosinophilia was increased in 3 and in these not greatly (10 to 17; 15 to 20; 12 to 13 per cent.); in 1 it remained the same (26 per cent.); in 4 it was reduced (13 to 10; 26 to

21; 20 to 18 and 26 to 10 per cent.). With Miracil D, 14 patients were treated; the average before treatment was 16·6 and after it 18·8 per cent., but there were marked differences. One increased from 1 to 17, another from 28 to 42 per cent.; some showed a considerable fall, 31 to 18; 12 to 4; 42 to 33 per cent.

To sum up: Fuadin is followed by a marked increase in eosinophiles, from 1,775 to 2,156 per cmm. (the percentages are stated above); Solustibosan causes little change, a relative increase of 2 per cent., but in actual numbers a fall from 1,260 to 1,200; Glucantime a fall from 19·3 to 16·7 per cent., and in absolute numbers 1,210 to 773 per cmm.; Miracil D a small increase from 955 to 1,107 per cmm. The authors acknowledge that with this last they gave smaller doses than those generally recommended, that the lethal effect on the schistosome was slight and this agrees with the slight eosinophilia reaction. [In no case are the doses of the different drugs mentioned.] In a series of tables are given certain details of each of the patients: their ages, sex, colour, clinical type, the number of leucocytes and of eosinophiles and the percentages of the last before and after treatment, a final table of the numbers of patients treated with each of the 4 drugs, their average ages, the average numbers of leucocytes and of eosinophiles and the percentages of the last before and after treatment. *H. Harold Scott*

BARRETO, A. M. Esquistosomose aguda—abdomen agudo—obstrução intestinal por granuloma esquistosomótico. [Acute Schistosomiasis. Acute Abdomen and Intestinal Obstruction from Schistosome Granuloma] *Brasil-Médico*. 1953, June 6 & 13, v. 67, Nos. 23/24, 420-22. [19 refs.]

Report of a case.

RUIZ RODRÍGUEZ, J. M. Síndrome de Banti bilharziano en Venezuela. [Banti's Syndrome associated with Schistosomiasis mansoni in Venezuela] *Gac. Méd. de Caracas*. 1953, July-Sept., v. 61, Nos. 7, 8 & 9, 241-57.

After a fairly full account of the origin and development of the term "Banti's syndrome", the author defines it as a condition characterized by initial splenomegaly, haemorrhage from the alimentary tract (haematemesis and melena), reduction of red corpuscles, granulocytic leucopenia and thrombocytopenia and hepatitis passing on to cirrhosis with terminal ascites. In a table he presents a score of conditions in which this syndrome occurs: the true Banti's disease of undetermined origin and 19 others (pseudo-Banti of some authors) including 6 associated with parasites, schistosomes, leishmania, malaria and others; 3 infections, endocarditis, brucellosis and other septic processes; 2 specific, syphilis and tuberculosis; 3 toxic, alcohol, lead and phosphorus; 4 metabolic, and primary spleno-portal thrombophlebitis.

The association of the syndrome with *Schistosoma* infection was first noted by Romero SIERRA in 1917. The author then records the existence of these various symptoms in 49 cases of infection by *S. mansoni* in the States of Miranda, Aragua, Distrito Federal and Carabobo where schistosomiasis is endemic. The ages of the patients ranged from 12 to 65 years, most under 50 years and the average 26·9 years; males were twice as numerous as females. Previous malaria was reported in 46·3 per cent. [? 23; throughout this article figures are given in percentages only. As the total was 49, to save many calculations the actual numbers will be nearly correct if the percentage figures are halved]; strong history of alcoholism in 17·7 per cent., dysentery in 42·5, dyspepsia in 83·3. All were

poorly nourished. Ova of *S. mansoni* were seen in 28 (57.1 per cent.); hookworm or other intestinal parasites in 9 [given as 32.5 per cent., it should be 18.4]; splenomegaly, Boyd's type 2, in 72.09 per cent., and hepatomegaly to 2 fingers' breadths below the costal margin in the same proportion; haematemesis due to rupture of gastro-oesophageal varix in half the cases, ascites in 30.4 per cent., jaundice in 15.9 per cent. of those in hospital and a history of it in 4.3 before coming under observation.

The blood changes are detailed: red corpuscles ranged between 1,450,000 and 4,160,000 per cmm., with an average of 2,583,000; haemoglobin was low in all, below 10 gm. per cent. in 19 and a general average of 8.22 gm.; the anaemia was of the macrocytic or hypochromic normocytic types; leucocytes varied between 2,000 and 6,200, with average of 4,900. Occasionally a transient leucocytosis to 12,000 was seen after a haemorrhage or some infective process. Platelets in 12 of 19 patients examined were below 100,000 per cmm., in 3 between 100,000 and 200,000, and twice, in patients with splenoportal thrombophlebitis, above 500,000. In all cases there was a definite increase in granulocytes and platelets after haemorrhages and just after splenectomy. Proteinaemia was within normal limits in 67 per cent., in 7 per cent. it was above normal and in 26 per cent. below 6.3 gm.—the limit of normal. Albumin was normal in 17 and below normal in 83 per cent.; between 3 and 4 gm. in 50 per cent., between 2 and 3 in 17, and between 1 and 2 in 13 per cent.; globulin was normal in 35, increased in 65 per cent. Blood bilirubin estimation was carried out in 46 patients; in 65 per cent. [? 30 patients] it was normal, between 0.72 and 0.14 mgm. per cent. indirect. In the others the direct van den Bergh reaction was between 3.87 and 0.88 mgm. per cent. Hanger's cephalin-cholesterol reaction was performed in 9 patients and was strongly positive in 6, positive in 2, negative in 1. The thymol turbidity test was high in all of 24 patients subjected to it, with values between 7.31 and 41 units, average 20.1.

As regards the histopathology little need be said, as that is well known—thickening of the spleen capsule, subcapsular and trabecular haemorrhages and a certain degree of reticular hyperplasia and fibrosis, follicular and perifollicular haemorrhage and endo- and peri-arteritis.

H. Harold Scott

PALMER, E. D. & JAHNKE, E. J., Jr. Observations on Portal Hypertension among Schistosomiasis Patients with relatively Insignificant Complaints.

Amer. J. Trop. Med. & Hyg. 1954, Jan., v. 3, No. 1, 139-46, 3 figs. [17 refs.]

The authors, working in the department of gastrointestinal and vascular surgery of the Walter Reed Army Hospital at Washington, have had an opportunity of examining 46 soldiers with schistosomiasis for evidence of portal hypertension. Some of these men (17) came from Puerto Rico, an area where *Schistosoma mansoni* is endemic, the others had served in Leyte (3 men) or Mindanao (26 men) in the Philippines, an area where *S. japonicum* is endemic, during the recent war; 14 of them had previously had unsuccessful treatment for their infections. All suffered from various abdominal symptoms, but none of them severely. In all cases the diagnosis of *Schistosoma japonicum* or of *S. mansoni* infection was established by stool examinations, rectal aspirations and rectal biopsies. Eggs were recovered by biopsy of the liver in 11 of the 20 patients on whom it was done. In 8 patients the biopsy examination indicated that the liver was normal, but in the others the appearances were those of periportal fibrosis with foreign body granulomatosis. A number of liver function tests were

done on the 46 patients, and in 14 cases these showed significant abnormalities, principally raising of the serum bilirubin and increased brom-sulphthalein retention.

None of the patients had ascites, but 14 had splenomegaly (11 *S. mansoni* and 3 *S. japonicum*). Oesophagoscopy of 21 men showed 7 to have oesophageal varices (6 *S. mansoni* and 1 *S. japonicum*); gastroscopy of 36 showed only 1 to have gastric varices (*S. japonicum*). Nine of the patients gave a history of significant haemorrhage from the gastrointestinal tract, and 4 of sudden haematemesis. Apart from these symptoms, and the findings already mentioned, there were no gross indications of portal hypertension. In those cases in which oesophageal varices were found the larger of these were in the distal part of the oesophagus, as occurs with portal hypertension following Laënnec's cirrhosis. In most cases specific treatment of the schistosomal infection had little effect on these varices, and none on the portal pressure levels as determined by trans-oesophagoscopic measurements.

Three of the patients were treated surgically; in one splenectomy was done because of "severe hypersplenic hematologic disease". In the other 2 an end-to-side portal-caval shunt was done, because the portal pressures were high. In the first of these 2 the portal vein pressure, initially 510 mm. of water, fell to 300 mm. of water during the operation; in the second it fell from 530 to 254 mm.; the varices eventually disappeared from both.

In comment the authors say that in view of the existing collateral circulation of the portal system, as indicated by the presence of varices, the risk of dissemination of eggs by the shunt operations can largely be disregarded. The danger of rupture of varices makes operative interference rather urgent; although prior specific schistosomal treatment is very desirable there should be no undue delay for this purpose. Portal decompression is indicated in selected cases as soon as oesophageal varices are detected, even when there has been no premonitory haemorrhage from them. Routine percutaneous lienoportal venography prior to operation will obviate a fruitless exploration of a blocked portal vein, and show the need for the alternative operation of spleno-renal shunt. Finally, radiographic methods of examination for oesophageal varices are unsatisfactory; oesophagoscopic examination is a necessary routine in patients with a possible portal hypertension.

A. R. D. Adams

BOND, H. W. & NOLAN, M. O. **Results of Laboratory Screening Tests of Chemical Compounds for Molluscicidal Activity. II. Compounds of Mercury.** *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 187-90.

Continuing their tests of chemical compounds as molluscicides, using *Australorbis glaberratus* [this *Bulletin*, 1953, v. 50, 1061] the authors tested 9 inorganic and 23 organic compounds of mercury. Best results were obtained with the organic compounds, especially the phenylmercuric salts, many of which were fully effective at a dilution of 1 part per million. At a dilution of 0.3 p.p.m., 4 compounds were effective enough to be selected as having outstanding molluscicidal properties. These are isopropylmercuric thiocyanate and phenylmercuric acetate, each of which caused 90 per cent. mortality in the snails, and *n*-propylmercuric thiocyanate and phenylmercuric nitrate, each with a 60 per cent. kill. Pentachlorophenol, which was considered in the previous report to be the "compound of choice", is now superseded, as the result of these laboratory trials, by many of the mercury compounds which "should be thoroughly investigated in the field

since, although they are known to be toxic to man and other animals, the concentrations necessary to effect a rapid and complete kill of snails are so low that these compounds perhaps can be applied with safety to waters used by man".

J. J. C. Buckley

DEWITT, W. B. **Influence of *Schistosoma mansoni* Infections on the Eosinophil Level of Adrenalectomized Mice.** *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 358-65, 1 fig. [13 refs.]

"The influence of adrenalectomy on the eosinophil response of mice infected with *Schistosoma mansoni* was determined by repeated eosinophil counts, with subsequent observations on gross pathology and the development of the parasite in the host. It was found that an eosinophilia developed at the same time and to the same degree in adrenalectomized mice as in sham adrenalectomized mice but was of a shorter duration. In the adrenalectomized mice the eosinophil level rapidly returned to normal, indicating inability to respond to prolonged eosinophil-producing stimuli. The gross pathology from *S. mansoni* infections appeared the same in the two groups of animals but non-adrenalectomized mice survived the infection for longer periods than did the adrenalectomized mice."

[The term "sham adrenalectomized mice" refers to those mice on which an operation was performed which duplicated the complete operative procedure except for the actual removal of the adrenal glands.]

R. M. Gordon

PAN, C., WILLIAMS, R. R. & RITCHIE, L. S. **The Penetration-Time for the Cercariae of *Schistosoma japonicum*.** *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 136-8.

The 76 mice and 30 hamsters used in these experiments were clipped and shaved over the back 24 hours before exposure. The prepared area was exposed to 75 to 100 *S. japonicum* cercariae for periods varying from 10 seconds to 5 minutes, and immediately on completion of the exposure the animal was rubbed dry with a piece of slightly moistened gauze. Three to four weeks after exposure the animals were killed and the adult schistosomes collected at the autopsy, by the use of the perfusion technique, described by PAN and HUNTER [this *Bulletin*, 1951, v. 48, 1012] and counted. The results of the various counts showed that in the case of mice exposed for periods varying from 10 seconds to 2 minutes, 3 per cent. to 10 per cent. of the cercariae had penetrated and reached adult form. When the exposure period was increased to 3 minutes, 52 per cent. of the cercariae were found to have reached adult form, and after 5 minutes 55 per cent. Somewhat similar results were obtained when hamsters were used instead of mice. After 20 seconds' exposure no adults were found, after 30 seconds 1·4 per cent. of the cercariae applied penetrated and developed, after one minute 8·2 per cent., after 2 minutes 14·2 per cent. and after 3 minutes 98 per cent.

The hazard of even very short contacts with water containing *S. japonicum* cercariae, if followed by air-drying (in distinction to drying the skin with a cloth) was demonstrated in another series of experiments in which 10 mice were exposed for 10 seconds and 5 mice for 15 seconds to *S. japonicum* cercariae, at the end of which time the skin was rapidly dried under an electric fan. Under these conditions, 10 seconds' exposure resulted in 36 per cent. of the cercariae attaining adult form while 15 seconds' exposure raised the figure to 66 per cent.

R. M. Gordon

KAGAN, I. G. **Experimental Infections of Rhesus Monkeys with *Schistosomatium douthitti* (Cort, 1914).** *J. Infect. Dis.* 1953, Sept.-Oct., v. 93, No. 2, 200-206. [26 refs.]

This paper is concerned with the ability of the cercariae of *Schistosomatium douthitti*, a dermatitis-producing species normally endemic in rodents in the United States, to develop in rhesus monkeys, and with the reactions observed in the skin and other organs of such animals following the penetration of large numbers of these cercariae.

The author's summary is as follows:—

"Sexually mature or young developing male and female worms of *Schistosomatium douthitti* were recovered from the venules of the liver or intestinal veins of 9 rhesus monkeys (*Macaca mulatta*) exposed to the cercariae of *S. douthitti*. These animals were exposed to 2500 to 45,000 cercariae and necropsied 10 to 25 days later. Five monkeys exposed to 6000 to 10,000 cercariae of *S. douthitti* and necropsied 30 to 96 days after exposure were negative.

"The recovery of dead and dying worms from monkeys necropsied 10 to 25 days after exposure suggests that resistance to infection in this host may begin as early as the second week after exposure. The recovery of no worms in 5 animals necropsied 30 to 96 days after exposure suggests that the infection is completely terminated in 3 to 4 weeks.

"Monkeys exposed to the cercariae of *S. douthitti* develop a schistosome dermatitis very similar to the dermatitis reported for man. In the monkey the rash disappears in 5 to 7 days. In animals previously exposed to the cercariae of *S. douthitti* the dermatitis which develops after second exposure was not as intense as the dermatitis which developed in animals exposed for the first time.

"Monkeys exposed to cercariae of *S. douthitti* are resistant to a second exposure of *S. douthitti*; however, a previous exposure of *S. douthitti* does not protect an animal from infection with *Schistosoma mansoni*. From the pathology of the lungs at necropsy it appears that in resistant animals cercariae do not reach the lungs.

"... The susceptibility of men toward infection with animal schistosomes is discussed."

[These findings appear to support the view now held by most workers on schistosomiasis that the dermatitis which follows the invasion of the skin by various species of cercariae may be due either to previous sensitization by the same or different species, or else may occur independently of any previous exposure, in which case it is due to the introduction of a substance which, for want of a better term, we may call a toxin.] R. M. Gordon

SHIRAKAWA, T. [Studies on the Lung-Flukes. I. Report; On the Distribution of Metacercariae of Genus *Paragonimus* in Shikoku Island, Japan] *Shikoku Acta Med.* 1953, Oct., v. 4, No. 5, 197-9. [14 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"We know that many inhabitants in Shikoku Island are suffering from paragonimiasis.

"We have tried to make an exact investigation of the distribution of metacercariae of Genus *Paragonimus* in Shikoku Island, for its distribution chart is very important for the preventive medicine.

"We have obtained the following results:

"(1) The crabs (*Sesarma intermedia*, *Sesarma dehaani* and *Helice tridens* etc.) which are seized at the mouth of Yoshino-, and Naka River in Tokushima

Prefecture are not parasitic on metacercariae of *Paragonimus ohrai* Miyazaki and *Paragonimus iloktsuenensis* Chen.

"(2) *Eriocheir japonicus* (De Haan) which are seized with Yoshino-, Katsuura and Naka River in Tokushima Prefecture are parasitic on metacercariae of *Paragonimus westermanii*.

"(3) Though *Eriocheir japonicus* seized in the Shimanto River in Ehime- and Kochi Prefecture are parasitic on a great many metacercariae of *P. westermanii*, *Patamon dehaani* (White) seized in the same river are not parasitic."

MOMOSE, T. [Studies on the Treatment of Paragonimiasis. (Report I)]
Shikoku Acta Med. 1953, Dec., v. 4, No. 6, 247-53, 6 figs. [11 refs.]
 [In Japanese.]

The English summary appended to the paper is as follows:—

"For the treatment of paragonimiasis, various medical compounds were used, but most of all were not effective. Among many medicaments, Emetinum hydrochloricum is effective, and we use it combined with sulfonamides. However some by-effects and relapses were unavoidable. In order to search a suitable therapeutical method, we investigated experimentally the effectiveness of various agents.

"Methods:

"1. Adult lung flukes removed from worm cysts showed a peculiar peristaltic movement.

"2. The frequency of the movement per minute was taken. The effects of physical and chemical agents *in vitro* are estimated, in correlation with change of the movements frequency.

"Results:

"A. Temperature: at 45 to 50°C, the peristaltic movement ceased and in results worms perished in a few minutes.

"B. Hydrogen-ion-exponent: no remarkable alteration was observed.

"C. Emetinum hydrochloricum and stibnal: no particular effectiveness.

"Ethoxydiaminoacridine lactate: even a solution of 1:1600 displayed a powerful effect.

"Ultra short waves: in 50 minutes the worm perished.

"E. X-ray irradiation (6000 r): no macroscopical alteration was detected."

SADUN, E. H. & MAIPOOM, C. Studies on the Epidemiology of the Human Intestinal Fluke, *Fasciolopsis buski* (Lankester) in Central Thailand. *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1070-84, 4 figs. & 4 maps.

A Thai girl, 15 years old, was found to be harbouring 466 *F. buski* on autopsy. She had previously vomited 29 flukes and passed 6 in stools. The chief symptoms were abdominal pain, oedema and low fever of one month's duration. Autopsy findings also included congestion of lungs, liver, spleen and kidneys and there was fatty degeneration of the liver. Since the patient came from Ayuthia Province, whence no *F. buski* had previously been recorded, surveys for the infection were carried out in that Province and in Nakorn Phatom Province. A village in Dhonburi Province was also examined where 5 cases had been reported in 1941 [this *Bulletin*, 1942, v. 39, 564].

Of 802 unselected people examined in the Bang Kun Sri area (Dhonburi) from 6 villages, 18 per cent. were found to be passing eggs of *F. buski*. Of 354 examined from 2 villages in Ayuthia Province, 15 per cent. were positive and of 407 examined from 2 villages in Nakorn Phatom Province, one per cent. was positive. The incidence of hookworm in these 3 groups was the converse of that of *F. buski*, being 5 per cent., 1 per cent. and 20 per cent. respectively, and this is referable to topography in relation to defaecation habits, namely, water-covered areas into which defaecation occurred and areas where defaecation took place under fruit trees or on ground distant from water. The endemicity of *F. buski* infection is believed to be correlated with cultivation of water caltrop (*Trapa bicornis*). Children of 10 to 14 years of age showed the highest incidence and intensity of infection.

J. J. C. Buckley

URQUHART, G. M. **The Rabbit as Host in Experimental Fascioliasis.** *Exper. Parasit.* New York. 1954, Jan., v. 3, No. 1, 38-44.

ALVES, W. D., GELFAND, M. & WEINBERG, R. **A Case of Sparganosis in an African from Portuguese East Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Jan., v. 48, No. 1, 87-8, 2 figs. on pl.

Sparganosis is rare in Africa, though 2 cases have been recorded from East Africa [this *Bulletin*, 1944, v. 41, 301].

The present authors record a case in an African aged 33, born in Portuguese East Africa and resident there until 3 years ago, when he moved to Salisbury, S. Rhodesia. He was admitted to hospital there with an intermittent pain of 3 months' duration in the right thigh and leg.

The only abnormalities of significance found were very many discrete, hard, mobile nodules under the skin and above the muscles, mostly in the anterior abdominal wall, upper parts of the thighs and lower thoracic region. There were a few nodules in the neck and limbs. X-ray showed scattered oval calcified areas of varying size throughout the abdomen, pelvis and thighs. These are illustrated in 2 skiagrams. Biopsy showed hard nodules of varying size containing narrow worms.

The original diagnosis was that of cysticercosis, which is common in S. Rhodesia, and the diagnosis was made only when the nodules were opened. The X-ray features also closely resembled those of cysticercosis, though the cysts were perhaps too long and narrow for those of *T. solium*.

The worm was identified by Professor J. J. C. BUCKLEY as a sparganum, but specific diagnosis could not be made on morphology alone, as this is almost impossible.

H. J. O'D. Burke-Gaffney

WEINSTEIN, P. P., KRAWCZYK, H. J. & PEERS, J. H. **Sparganosis in Korea.** *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 112-29, 17 figs. on 2 pls. [31 refs.]

"Three cases of sparganosis in Koreans were encountered. The larvae varied from 23 to 30 cm. in length and were removed by surgery from the musculature of the abdominal or lower chest area. The histopathology of the tissues in contact with the worms is described, and the presence of Charcot-Leyden crystals noted in one case in the masses of degenerating eosinophil leucocytes which preponderated in the inflammatory response. The pathogenesis of the tissue lesion appears to be due to a direct toxic effect of substances which probably diffuse through the cuticle of the

sparganum, as well as a possible sensitization to some of these products. All patients gave a history of eating raw snake. A specimen of *Dinodon rufozonatum* caught in the area was found to be heavily parasitized with plerocercoids. When guinea pigs were infected with these by inserting the larvae subcutaneously, the worms migrated and grew at a rapid rate. It is probable that human sparganosis is acquired in Korea by the consumption of raw snake, which is a fairly common practice in this area."

OELKERS, H. A. & OHNESORGE, G. Über die Herzgiftigkeit von Filixstoffen. [The Toxic Effect of Male Fern Extracts on the Heart] *Klin. Woch.* 1954, Mar. 1, v. 32, Nos. 9/10, 226-7, 2 figs.

Some records of observations on the toxic effect of extracts of male fern and of Filmaron on the heart are here mentioned and a recent report of the death of a man from acute dilatation of the heart following his 5th course of male fern treatment within a year for tape worms again draws attention to this danger. There is not much in the literature about the cardiac effect of male fern. Here briefly described are experiments on cats and rabbits which were given intravenous injections of Filmaron or extracts of the fern by mouth in lethal doses. In these animals there resulted a severe cardiac involvement—arrhythmia, disturbance of ventricular conductance and myocarditis.

M. E. Delafield

MAZZOTTI, L. & TREVÍÑO, A. Ensayo de tratamiento con "Dietilcarbamazina" (Hetzazán) en tres casos de cisticercosis humana. [Trial of Diethylcarbamazine in Three Cases of Human Cysticercosis] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Sept., v. 13, No. 3, 209-11.

Diethylcarbamazine (Hetzazan) having proved its use in certain forms of helminthiasis, the authors determined to try it in 3 cases of human cysticercosis. [They call them "subcutaneous cysticercosis" because only those situated in these tissues were examined, but doubtless the larvae were present in muscular tissue also.]

The first patient was a man of 41 years who, 5 years earlier, had noticed 5 small tumours under the skin; 1 in the upper lip, 1 in front on the right side of the chest, 1 in the right forearm and 2 in the right upper arm. One was extirpated and the diagnosis of cysticercosis confirmed. The patient was given diethylcarbamazine *per os*, 60 mgm. daily for a fortnight and the course was repeated 5 times after intervals of a fortnight. On the 12th day after beginning the treatment the patient noted signs of inflammation of the tumour sites, which disappeared 2 days later. At the end of the treatment repeated examination failed to discover any signs of the tumours.

The second patient was a child of 4 years with 3 small tumours in the left flank which, according to the mother, had appeared "several months before". Again, diagnosis was confirmed by extirpation of 1 of them. Diethylcarbamazine, in 30 mgm. dose daily, was given for 10 days and this was repeated 4 times with intervals of a month. At the end of that time 1 cyst had disappeared, the other, on extirpation, was caseous with nothing characteristic of a cysticercus.

The third patient, a man of 39 years, had noticed 3 years before 17 tumours in various parts of the body and the diagnosis was confirmed as in the others. He was given 100 mgm. of diethylcarbamazine daily for 6 days, repeated twice, once after an interval of 6 months, the second time after a year's interval. In June 1953 [there is no indication as to when

the treatment was begun] he reported that 9 of the tumours had disappeared, and on examination only 6 were found remaining [2 others must have disappeared, escaping the notice of the patient]. One of those remaining was extirpated and contained a living cysticercus. [Obviously diethylcarbamazine is successful in some instances, but not in all.]

Although there is no certainty of the length of survival of these cysticerci, the authors deduce that it is at least 5 years, for the third patient from whom a live cysticercus had been extirpated had observed the tumours 5 years before. The dangers of ocular cysticercosis are referred to, particularly if the larva dies there and persists. The authors refer to a paper by Canales SAENZ, published in 1945, on 11 cases of ocular cysticercosis in Mexico Town.

H. Harold Scott

FISCHER, J. T. & TRAIBEL, J. Hipertiroidismo hidatídico. [**Hydatid Cyst of the Thyroid and Hyperthyroidism**] *Archivos Uruguayos de Med., Cirug. y Especialidades*. 1953, Sept.-Oct., v. 43, Nos. 3/4, 145-55, 2 figs. [13 refs.]

The English summary appended to the paper is as follows:—

“ 1st. Two cases were presented of hydatid cyst of the thyroid glands and hyperthyroidism.

“ 2nd. In both cases hyperthyroidism disappears under surgical treatment of the hydatosis of the gland.

“ 3rd. In the second case the surgical operation gave the experimental proof that the presence of the cyst was the cause of hyperthyroidism which justified mentioning the existence of a hyperthyroidism of hydatidinous etiology.”

HUESTON, J. T. **Hydatid Disease of the Pericardium**. *Australasian Ann. of Med.* 1952, Nov., v. 1, No. 2, 186-94, 11 figs. [30 refs.]

“ 1. A case is reported of hydatid disease of the pericardium which followed rupture of a primary myocardial cyst and which later ruptured back into the pulmonary artery, producing multiple pulmonary hydatid cysts. Death was due to haemorrhage from the intrabronchial rupture of one of the pulmonary cysts.

“ 2. Some aspects of the pathology of cardiac hydatid disease are discussed, in particular the route of infestation and the consequences of pericardial rupture.

“ 3. The fate of peripheral hydatid emboli is discussed, especially the failure of many emboli to survive after implantation.

“ 4. The problems of diagnosis and treatment of hydatid disease of the heart and pericardium are considered in the light of modern techniques.”

d'ESHOUGUES, J. R. & HOUEL, J. Syndrome de Pancoast-Tobias d'origine échinococcique. [**Pancoast-Tobias Syndrome in a Case of Echinococcus Infection**] *Bull. et Mém. Soc. Méd. Hôpital. de Paris*. 1954, Nos. 3/4, 59-62, 2 figs. [15 refs.]

LIPPARONI, E. Sulla anchilostomiasi nella zona del medio Uebi Scibeli. [**Ankylostomiasis in the Middle Webi Shibeli**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Nov., v. 34, No. 11, 593-611. [15 refs.] English summary.

Lipparoni briefly refers to the work of others who have carried out surveys and mass treatments in the area and he then discusses the local customs

and other circumstances which have a bearing on the intensity of infestation and the various problems of treatment and of preventive measures. He considers that only a minority of those infested can be considered to be ill; the rest are symptomless carriers.

In this area of Somaliland during 1935-1952 Lipparoni has seen an aggregate of 5,126 "clinical" cases of ankylostomiasis and he discusses the distribution of this infestation by sex, married state (a considerable proportion of women are said to practise geophagy during pregnancy), age and mode of life, e.g., nomadic, settled, etc. He also reports the association which he has observed between hookworm and other helminthic infections. He has found evidence of ariboflavinosis among the common signs and symptoms and he touches on the possible mechanics of hookworm anaemia, which is not necessarily cured solely by successful disinfection.

Lipparoni goes over the various anthelmintics which are commonly used against hookworm—carbon tetrachloride, a combination of this with the active principle of chenopodium (Ascaridole) and the more recently introduced tetrachlorethylene. Injections of iron, sometimes combined with arsenic treatment, liver extract and vitamin preparations may be required for the anaemia and for pellagroid and other general symptoms.

In the absence of a substantive general rise in nutrition and the standard of living, however, there is a limit to what can be achieved in the sphere of prevention through such public health measures as mass treatment, improved night soil disposal, better personal hygiene, more sanitary housing, etc.

J. Cauchi

JUNGALWALLA, A. **Ascariasis in Children.** *Indian J. of Child Health.* 1952, Aug., v. 1, No. 8, 389-400.

Out of 3,754 medical cases admitted to the Byramjee Jeejeebhoy Hospital for children in Bombay in 1951, 362 were affected with ascariasis. This paper is a detailed study of 75 selected cases. The highest incidence was in children under 2 years of age and the sexes were about equally infected. Only 5 of the children were considered to be in a good nutritional state and 54 were regarded as badly nourished. A table gives the numbers of the manifestations of vitamin deficiencies that were observed. The clinical symptoms and signs found in these cases of ascariasis are described. There were 4 deaths, all in children under 2 years of age in this series—2 died with toxic cerebral symptoms and 2 from severe malnutrition and dehydration. Diagnosis by stool examination, blood examinations and by X-rays is described. There is also an account of treatments with santonin, oil of chenopodium, hexylresorcinol and diethylcarbamazine. For the prevention of ascariasis stress is laid on the most important measure in prophylaxis—the education of the people in proper hygienic habits. *M. E. Delafield*

GERMANS, W. Laboratoriumsuntersuchungen über die Resistenz der Eier des menschlichen Spulwurmes *Ascaris lumbricoides* L. [Laboratory Experiments on the Resistance of the Ova of the Human Round Worm, *Ascaris lumbricoides*] *Ztschr. f. Parasitenk.* 1954, v. 16, No. 2, 93-110, 15 figs. [Numerous refs.]

This paper records the findings of the author in a considerable range of experiments on *Ascaris lumbricoides* which were designed to study the development and resistance of the ova under various physical, chemical and biological conditions. The physical effects of moisture in soil, atmospheric

humidity, sunlight and ultra-violet light of different wave lengths, temperature, pressure and of centrifugation on survival of the eggs were studied. Also studied were the influence of variations in the aerobic and anaerobic conditions, the resistance to various chemical poisons and the period of life of the ova when included in growing cultures of bacteria and of moulds. Experiments were made on the power of the eggs to adhere to plants and on the specific gravity and sedimentation rate of the ova.

The main conclusions are in conformity with the published work of others. There is considerable resistance to physical factors although the ova are susceptible to drying and high temperatures. Of the chemical poisons tested only phenol and carbon disulphide are lethal in a short time. In bacteria and mould cultures the eggs survived with the exception that methane in the cultures of methane-producing bacteria had a toxic effect.

M. E. Delafield

OLIVER-GONZALEZ, J. Adsorption of A₂ Isoagglutinogen-Like Substances of Infectious Agents on Human Erythrocytes. Proc. Soc. Exper. Biol. & Med. 1953, Dec., v. 84, No. 3, 520-22.

" 1. Partially purified polysaccharides isolated from dry worm material from adult *Ascaris lumbricoides* (var. *suum*); the larval forms of *Trichinella spiralis* and adult *Taenia saginata* adsorbed onto human erythrocytes of groups O and B, when these were incubated at 37°C or stored at 6°C in saline suspensions of the polysaccharide. 2. The treated erythrocytes were added to human serums of groups O and B and the α_2 isoagglutinin titers were reduced to zero. No significant reduction of the α_2 isoagglutinin titer was observed when control erythrocytes were added to the serums. 3. The titers of the α_1 was slightly reduced and that of the β isoagglutinins was unaffected. 4. The fact that the erythrocytes treated with the polysaccharides inhibited the α_2 agglutinins is used as evidence to show that the polysaccharides adsorbed onto the red cells. 5. Adsorption of polysaccharides with A₂ isoagglutinogen-like properties, onto erythrocytes of human groups O and B gives the cell characteristics pertaining to a different group, i.e. the A₂ group. The possibility of such phenomenon occurring during actual infection, and the relationship which it may have with the development of autohemagglutinins is mentioned."

BACIGALUPO, J. Ascaridiasis hepática. (Parasitismo errático larval.) [Ascaris Infection of the Liver] Gac. Méd. de Caracas. 1953, May-June, v. 61, Nos. 5/6, 205-15, 6 figs. English summary.

Report of a case, with worms in the liver, bile-duct and gall bladder.

GHANEM, M. H. The Treatment of Ascariasis and Ancylostomiasis with Hetrzan (Diethylcarbamazine). Trans. Roy. Soc. Trop. Med. & Hyg. 1954, Jan., v. 48, No. 1, 73-6.

The author from Alexandria briefly summarizes earlier papers on the treatment of ascariasis of dogs and man with diethylcarbamazine [see this *Bulletin*, 1953, v. 50, 433 for other references]. He himself treated a total of 125 human patients with ascariasis and 35 with ankylostomiasis, 102 having pure *Ascaris* infections (71 males and 31 females), 13 pure *Ancylostoma* infections (11 males and 2 females) and 23 mixed infections with these two nematodes. The patients were all adults aged 16-60 years and they suffered from various other diseases. The stools were examined twice before treatment and every 3 days after treatment started. One ounce of

Mist. alba was given each morning. The dosages of diethylcarbamazine were: (1) one dose of 10 mgm./kgm. body weight in 24 hours, given in 3 equal doses after meals for 3 days and, if worms were not expelled, repeated in the same way for 3 days. This dosage was given to 86 patients with pure *Ascaris* infection, 13 with pure *Ancylostoma* infection and 18 with mixed infection and it was repeated up to 5 times, a total of 104 persons with ascariasis and 31 with ankylostomiasis being treated with it: (2) 25 mgm./kgm. body weight daily for 3 days, repeated up to 3 courses, if worms were not expelled. This was given to 16 patients with ascariasis and to 5 with mixed infection, a total of 21 patients with ascariasis and 5 with ankylostomiasis being treated with it. The following tables show the results obtained:

TABLE I

<i>Patients Cured</i>		<i>Ascariasis</i>	<i>Ankylostomiasis</i>
After the 1st course	...	43 (41·34%)	4 (12·9%)
,, „ 2nd „	...	16 (15·88%)	5 (16·12%)
„ „ 3rd „	...	14 (13·65%)	3 (9·67%)
„ „ 4th „	...	10 (9·61%)	4 (12·9%)
„ „ 5th „	...	10 (9·61%)	2 (6·45%)
After the 5 courses	...	93 (89·42%)	18 (58·06%)

TABLE II

<i>Patients Cured</i>		<i>Ascariasis</i>	<i>Ankylostomiasis</i>
After the 1st course	...	12 (57·18%)	0
„ „ 2nd „	...	2 (9·54%)	0
„ „ 3rd „	...	3 (14·28%)	2 (40%)
After the 3 courses	...	17 (80·95%)	2 (40%)

The *Ascaris* expelled by diethylcarbamazine were all dead and they first appeared on the third day with dosage (1) and on the first or second day with dosage (2). Seven of the 11 patients not cured by the drug were cured by oil of chenopodium; carbon tetrachloride, given to 9 of the 16 patients with ankylostomiasis not cured by diethylcarbamazine, cured 7 of them.

Symptoms of toxicity noted were nausea and anorexia in 117 patients taking course (1) and in 3 taking course (2); vomiting in 2 of the 21 taking course (2); activation of schistosomal dysentery in 4 of the 28 who had intestinal schistosomiasis; lassitude in 1 patient taking course (2) and a transient attack of bronchial asthma in 1 patient. Two pregnant patients tolerated course (2) for 9 days.

Tables compare the results obtained in the Tropical Medicine Department of Alexandria University in the treatment of ascariasis with oil of chenopodium, hexylresorcinol, santonin, carbon tetrachloride, carbon tetrachloride and oil of chenopodium in equal parts, and diethylcarbamazine; and of the treatment of ankylostomiasis with carbon tetrachloride, tetrachlorethylene, hexylresorcinol and diethylcarbamazine.

The author concludes that diethylcarbamazine is not the most effective drug, but that it is useful in some circumstances. It is nearly as efficient as other anthelmintics used for ascariasis, its advantages are that it is safe, it causes little inconvenience, it can be used for patients too ill to take other anthelmintics, and it can be given to children in a syrup. Its disadvantages are its cost, the relatively long duration of treatment with it and the

possibility of missing doses when it is used for mass treatment; and *Ancylostoma duodenale* is appreciably less sensitive to diethylcarbamazine. Hexylresorcinol, however, has about the same efficiency as diethylcarbamazine and it is a safe anthelmintic which can be given in a single dose.

G. Lapage

SOUTH PACIFIC COMMISSION, Noumea, New Caledonia. **Conference on Filariasis and Elephantiasis, Papeete, Tahiti, French Oceania, 21st August-1st September, 1951.** pp. vii + 108, 3 maps. [Numerous refs.] 1953.

This is the full, printed report of the Conference, summaries of which, in mimeographed form, have already been abstracted in this *Bulletin*, 1952, v. 49, 165, 787.

This complete account of the proceedings under one cover and in permanent form is a valuable store of information on filariasis in the South Pacific.

H. J. O'D. Burke-Gaffney

IYENGAR, M. O. T. **Filariasis in Thailand.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 6, 731-66, 3 figs.

The investigation reported here was carried out during the period November 1951 to February 1952. Filariasis was known to be endemic only in the western part of the peninsular portion of the country lying between the Indian Ocean and the South China Sea, and 4 provinces of that area were surveyed. The disease was found to be rural in distribution and to be associated with low population density, increases of which lowered the endemicity. The total endemic area in Thailand approximates to 2,200 square miles supporting 800,000 people, about one-twentieth of the population of the country. In a number of villages between 15 and 30 per cent. of the houses were visited between 8 p.m. and midnight. The occupants were examined for elephantiasis and blood smears were made from all those over 1 year of age. Of 4,112 persons examined, 21 per cent. had circulating microfilariae of *Wuchereria malayi* (one *W. bancrofti* infection was found, in a boy who had come from Hainan 4 years previously). Microfilarial counts of 5 or under per blood smear occurred in 34 per cent., the low counts being possibly due to the common use of mosquito curtains. Filarial disease was present in 215 (5.2 per cent.) of the persons examined, the earliest age of onset being 11 years. It was usually confined to one leg and only 9 had elephantiasis of the arm. Two cases of hydrocele were recorded but as no microfilariae were present the cause of the infection could not be determined.

Mosquitoes were collected in dwellings in the morning and 2,449 were dissected. Ten species were found infected and in 5 the filarial infection rate was 7 per cent. or higher. All the larvae found are stated to have been *W. malayi*. The vectors were shown to be *Mansonia annulifera*, *M. uniformis*, *M. indiana*, *M. longipalpis*, *Anopheles barbirostris*, two varieties of *A. hyrcanus*, *A. albotaeniatus*, *A. umbrosus* and *Culex sitiens*. Owing to the extent of the breeding places larvicide would be uneconomic. Drainage or reclamation of swamps would be difficult and control of *Mansonia* breeding by the use of herbicides would be impracticable and would not stop transmission by anopheline vectors. Mass chemotherapy would be very expensive and difficult to organize. Residual insecticidal spraying of walls at 167 mgm. of DDT per square foot was tried. A 95 per cent. reduction of filaria vectors over a period of 3 weeks was noted and the infection rates in mosquitoes were reduced from 7 per cent. to zero. It was, therefore,

recommended that spraying with 200 mgm. of DDT per square foot should be undertaken twice yearly in June to July and December to January just prior to the main transmission seasons.

Though *W. bancrofti* does not appear to be endemic in Thailand, *Culex fatigans* is very prevalent and carriers import the filaria from other countries. It is, therefore, recommended that *C. fatigans* in towns should be controlled.

T. H. Davey

WINCKEL, W. E. F., FROS, J. & WIJNGAARDE, E. *Wuchereria bancrofti in the Upper Eyelid.* Documenta Med. Geograph. et Trop. Amsterdam. 1953, Dec., v. 5, No. 4, 343-6, 3 figs. [26 refs.]

"Description of a stemmed doubling of the conjunctiva of the right upper eyelid in a 17-year-old boy. Histopathological examination revealed many transverse cuts of macrofilariae. As the peripheral blood contained only *Microfilariae bancrofti*, it is assumed that the worms were *W. bancrofti*. Attention is drawn to purulent inflammation around loose-lying filarial eggs. As the liberation of these eggs must be attributed to a trauma, the authors suggest that such a course of events may, generally speaking, lie at the root of an acute filarial attack."

- i. KARTMAN, L. **Frequency and Intensity of *Dirofilaria immitis* Infections in Mosquitoes.** Exper. Parasit. New York. 1954, Jan., v. 3, No. 1, 25-9, 2 figs.
- ii. KARTMAN, L. **On the Growth of *Dirofilaria immitis* in the Mosquito.** Amer. J. Trop. Med. & Hyg. 1953, Nov., v. 2, No. 6, 1062-9, 3 figs. [11 refs.]

(i) Batches of *Anopheles freeborni*, *A. quadrimaculatus*, *Aëdes aegypti*, *Aëdes albopictus*, *Culex pipiens*, *C. fatigans*, and hybrids of the *Culex* species were fed on a dog infected with *Dirofilaria immitis*: the density of microfilariae in the dog's blood at the time of the feeds (2.30 p.m. to 3.30 p.m.) varied from 17,000 to 18,000 microfilariae per cc. The fed mosquitoes were then kept on apple at 27°C. and 85-90 per cent. relative humidity and 10 to 15 females per species were dissected for developmental stages of the filaria until the twentieth day. Microfilariae which showed no development, even if they had reached the Malpighian tubules, were ignored. Histograms and a table illustrate the results. Percentages of mosquitoes infected varied from 29.8 per cent. (*C. pipiens*) to 100 per cent. (*A. freeborni*). Species with infection rates of less than 50 per cent. contained on the average about 1 worm per positive mosquito and only a few individuals harboured more than 5 or 6 worms. On the other hand, mosquito species which sustained infection rates of, or about, 100 per cent. were more heavily infected individually (means of 12.8 to 20.7 worms per female) and many of the mosquitoes harboured 10 to 30 worms.

(ii) Using the same species of anopheline and culicine mosquitoes infected in the laboratory from a dog with an infection of *Dirofilaria immitis*, the author measured the lengths (and breadths) of the developing filariae in the mosquitoes for a period of 20 days after their infecting blood meal. The size of microfilariae in the dog's peripheral blood varied from 238 μ to 294 μ in length and from a width of 4.9 μ to 6.6 μ (means: 265 μ \times about 6 μ). In a favourable host, *A. quadrimaculatus*, the following mean lengths and mean widths were obtained for successive stages in worm development: "sausage" stage, 111 μ \times 15 μ ; second stage, 347 μ \times 27 μ ; third stage, 850 μ \times 25 μ . Graphs show that these measurements occurred at about the 4th to 5th day

("sausage" stage), the 10th day (second stage), and the 15th day (third stage). Somewhat similar relationships of development with time are apparent for the species and hybrids of *Culex*, *A. freeborni* and *Aëdes albopictus* but the "sausage" stage at its minimum length is somewhat delayed and erratic in *Aëdes aegypti*, a poor vector. A table of the ratio of length to width of worm emphasizes the thick-set form of the short "sausage" stage and the progressive increase of length over width in later development towards the infective, third, stage which attains lengths of nearly 900 μ to over 1000 μ by the 15th or 16th day. Host factors appear to influence the length to which the worms will grow. Thus in *A. quadrimaculatus*, infective larvae were over 1000 μ in length from the 16th day to the 20th but never quite 900 μ long during this period in *C. fatigans*. Variation in lengths was apparent in third stage larvae in the same host, but it is not known whether this is linked with the sex of the worms.

In general, the results indicate that filarial growth varies from species to species of mosquito and that the taxonomic proximity of species of mosquito is not necessarily associated with a close similarity in filarial growth. This is particularly shown in the comparison of *Aëdes aegypti* and *Aëdes albopictus*.

[See also this *Bulletin*, 1953, v. 50, 835.]

D. S. Bertram

OVAZZA, M. L'onchocercose humaine et son aspect entomologique dans le Sud de l'A.E.F. [Human Onchocerciasis and Its Entomological Aspects in the South of French Equatorial Africa] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 575-86, 1 folding map on pl. [18 refs.]

This paper is an account of studies on onchocerciasis carried out over a period of 2 years in a large area of the Middle [French] Congo and neighbouring areas in Gabon. The results are considered in 3 separate sections, firstly a geographical study of the country in which the survey was undertaken, secondly a consideration of the entomological aspect of the problem and thirdly an account of the infection in man.

It is pointed out that the physical features and flora of the region appear to play an important rôle in the distribution of the vector. Four types of geological formations may be recognized; extensive sandy areas (known as *bateke* sands or *bateke* savanna) which lie to the north of Brazzaville, red sandstone and calcareous schists to the west of the city and lastly, crystalline formations.

The *bateke* savanna is not very uniform in character but may be described as a type of country in which the trees, very sparse and short, produce little shade and are concentrated near rivers and flooded areas. The rivers have sandy beds and are slow-flowing with no rapids or falls interrupting their courses. Where small forests exist on plateau, these are far from the rivers and the soil is dry.

The savannas of the West are on plateau formed by calcareous schists in the north and on rolling hills formed by sandstone in the south. The trees are low but more numerous and more uniformly distributed than in the *bateke* savanna. The rivers are faster and broken by falls and rapids.

In the north, west and south-west the savannas are limited by forests which in the north are associated with swamps. In the west there is a zone of uneven forest country with rivers interrupted by falls and rapids.

Only 2 species of *Simulium* have been found biting man, *S. damnosum*, and *S. albivirgulatum*. *S. medusaeformis* and *S. nigritarsis*, abundant in the larval and pupal stages, have never been captured as adults. *S. faini* reported from Léopoldville was not collected during the 2 years.

In the Middle Congo, *S. damnosum* and *S. albivirgulatum* are well separated in geographical distribution. *S. damnosum* is found in the savannas of the west and in the forests, and *S. albivirgulatum* in the bateke savanna. The limits of the distribution of these 2 species appear to be well defined.

An explanation of the characteristic distribution of the 2 species was sought for in the first instance by studying the larval and pupal habitat. The temperature and pH of the water seemed to be of little significance and an analysis of dissolved salts proved of little help. The degree of the oxygenation of the rivers and streams throughout the area surveyed was not estimated owing to technical difficulties, but that it may be of some importance is not denied. It was observed that the immature stages of *S. damnosum* are found in fast rivers with falls and rapids and those of *S. albivirgulatum* in slow-flowing rivers. The speed of the flow of water in which *S. damnosum* was found was measured and varied between 1.20 to 1.85 metres a second, whereas the speed of the water in which *S. albivirgulatum* was found varied between 0.40 to 1.10 metres a second. This fact, however, does not appear to provide a complete explanation of the sharp limits in distribution of the 2 species. In the bateke savanna there are fast-flowing rivers within the flight range of *S. damnosum* and yet this species does not occur there. Conversely, in areas in which *S. damnosum* is found, there are slow rivers closely resembling those of the western savannas and yet *S. albivirgulatum* has not been collected in this area, though it has a fairly long flight range.

It seems, therefore, that in seeking an explanation some attention must be paid to the habits and general ecology of the adults. It was noted that there are rarely eddies of air over rivers with sandy beds, whereas such eddies occur over rivers which are turbulent. In the case of *S. damnosum* which is found breeding in rapidly running waters and in rapids, it is thought that this factor may play an important part in determining its distribution. It was noted also that *S. damnosum* avoided strong sunlight whereas *S. albivirgulatum* bit readily in bright sunshine and it is thought that intensity of light may be of importance.

It appears then that at least 3 factors play an important part in determining the distribution of these 2 species: (1) the speed of the flow of water in the rivers; (2) the absence or presence of eddies of air over the rivers and, (3) the intensity of light.

Onchocerciasis has previously been reported from 2 areas in the southern part of French Equatorial Africa: in Western Gabon and in a region comprising the western banks of the Congo to the west of Brazzaville and the tributaries of the Congo to the west and north-west of this city. In this paper several new foci are reported from the Southern Middle Congo and Eastern Gabon, all within the areas in which *S. damnosum* has been collected. No microfilariae or cases of onchocerciasis were discovered in the areas in which *S. albivirgulatum* is found. Out of a total of 724 *S. damnosum* collected, 82 were found infected with *O. volvulus* whereas out of a total of 996 *S. albivirgulatum* collected none was found infected.

Finally, attention is drawn to the very small number of persons with microfilariae in 2 large villages on the Djoué river, though in neighbouring localities the population was heavily infected; out of a total of 414 persons examined only 6 were found to harbour microfilariae. In the view of the author the most likely explanation is that these 2 villages were much exposed to sunlight and the inhabitants had very little contact with the river.

M. M. J. Lavoipierre

MACCARTHY, Ethna. Infestation with *Trichocephalus dispar*. Ten Cases in an Irish Orthopaedic Hospital. *Lancet*. 1954, Feb. 27, 436.

The author briefly records the life history of *Trichuris trichiura* and reports on the infection of 10 children in a Dublin orthopaedic hospital with this species. There seems, she says, to be no earlier record of the infection of a group of children with *T. trichiura* in "these islands". The 10 children, aged 3 to 12 years, were passing *Ascaris lumbricoides* and this infection was treated with hexylresorcinol and santonin, the use of other anthelmintics being precluded by the debility of the children. After 3 or 4 examinations of the stools, the eggs of *T. trichiura* were found. Ficin and other forms of the latex of *Ficus glabrata* being unobtainable, another proteolytic enzyme, papain, was used in the form of enteric-coated capsules containing $7\frac{1}{2}$ grains (0.5 gm.). Magnesium sulphate was given on waking to remove the mucus protecting the heads of the whipworms and one hour later one capsule of ficin was given, food being withheld for one hour. This treatment was continued for 3 days and was repeated 3 times at about fortnightly intervals. One child refused to take the capsules and was given a rectal drip of papain grains 15 in 6 oz. water after a wash-out with magnesium sulphate given 2 hours beforehand; and this was repeated daily for 3 days. None of the children suffered toxic effects and apparently all were cured, no eggs of the whipworm being found 10 or more days after treatment. This treatment removed *Ascaris* earlier than *Trichuris*.

The infected children came from various Irish counties and from both urban and rural areas and the number of cases found in this one hospital suggests that the infection is more widespread than has been supposed. Many children pass *Ascaris*, but repeated stool examinations are needed to detect *Trichuris*, so that this species may be missed. JONXIS and BEKIUS [this *Bulletin*, 1954, v. 51, 79] state that papain was used as an anthelmintic in the 17th century and they record their own treatment of *Ascaris* infections with Velardon, which contains papain. The author states that papain is widely used in France and is marketed as Nematolyte. She considers that papain is not likely to reach the worms in effective concentration unless it is given either in an enteric-coated capsule or as a rectal drip and that granules containing it are not likely to be effective. She suggests that a higher rate of infection in children than in adults may be associated with lack of proteolytic enzymes in the gut.

G. Lapage

NORN, M. S. Paavisning af Oxyur-aeg. En sammenligning mellem Hall's, Markey's and Graham's metoder samt en modifikation af sidstnævnte (klaebecellofan-immersionsolie-metoden). [Demonstration of *Enterobius* Eggs. A Comparison of Hall's, Markey's and Graham's Methods and a Modification of the Last of These Methods (the Adhesive Cellophane-Immersion-Oil Method)] *Ugeskr. f. Laeger*. 1954, Jan. 21, v. 116, No. 3, 77-82, 10 figs. [31 refs.] English summary.

The Cellophane anal-swab method described in 1937 by Maurice C. HALL has been in general use in Denmark since 1943. After describing various other methods, Norn gives details of his own modification according to which the peri-anal region is swabbed with adhesive Cellophane and a drop of immersion oil is then placed on a microscope slide. The adhesive Cellophane is now spread out on the slide so that the immersion oil forms a thin film between slide and Cellophane. It is the use of immersion oil which makes Norn's method an advance on earlier methods, as is evidenced

by his comparison of 226 patients and 678 slides subjected to his modification and the original Hall test. This comparison shows that the number of persons found to be infected with *Enterobius* was twice as great with the Norn test as with the Hall test.

In the same number of *Ugeskrift for Laeger*, Norn publishes 3 other studies of round worms. The first concerns *Trichuris*, which was found in 21 per cent. of the 252 patients examined. No serious symptoms traceable to this worm were found, but pruritus ani was more common in the worm group (23 per cent. as compared with 8 per cent.). In the second article Norn harks back to *Enterobius* and shows that during an investigation of 609 persons with his immersion-oil modification, it was necessary to take 4 to 5 swabs to make sure of the presence of this worm (a single swab revealed its presence in only 58 per cent. of the persons finally found to be infected). Norn's third article deals with the same 609 persons and shows that the frequency of *Enterobius* was greatest at the school age and lower both before and after it. The hosts of *Enterobius* (from 70 to 88 per cent. of the schoolchildren examined) were not less healthy than the "inhospitable" controls. Indeed, dyspeptic symptoms were more common among them than among the "hosts"—a paradoxical finding also made by Per THYGESEN, a compatriot of Norn.

Claude Lillingston

CAPOGACCIA, L. & MASTRANDREA, G. Ulteriori esperienze sulle proteasi vegetali nelle infestazioni da elminti (*Enterobius vermicularis*). [Further Experience of the Use of Vegetable Proteases in Helminthiasis (*Enterobius vermicularis*)] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Nov., v. 34, No. 11, 588-92. English summary (3 lines).

The authors report on the results which they have obtained in treating 42 persons infected with *Enterobius vermicularis* using tablets prepared by the firm of Schwab under the proprietary name "Vermizyn", which they had already used in ascariasis [this *Bulletin*, 1954, v. 51, 198]. The formula is given in the abstract quoted above. The talc, sugar and gum arabic used are excipients and papain is the active proteolytic agent in the compound. The calcium carbonate ensures the necessary alkaline medium, the ferrocyanide combines with any hydrogen which is produced, the cysteine is included for its antitoxic properties and the yeast counteracts any liability to devitaminization from the treatment. The dosage for adults is 25 tablets a day (2 every quarter hour) for 5 days and the authors have given a second course, when necessary, after 15 days' rest. A laxative precedes anthelmintic treatment.

The authors have simultaneously prescribed various measures of personal and other preventive hygiene and have checked the results of treatment by a careful search for eggs in the anal folds. They claim success in 69·04 per cent. of their cases.

J. Cauchi

KÖTTGEN, H. U. & KUSCHINSKY, G. Vergiftungen mit Phenothiazin-haltigen Wurmmitteln. [Poisoning with Anthelmintics containing Phenothiazine] *Deut. med. Woch.* 1954, Feb. 12, v. 79, No. 7, 241.

For some years anthelmintic preparations containing phenothiazine have been in use in Germany, but haemolytic anaemia, hepatitis, kidney lesions and other effects have been attributed to them.

The authors discuss 8 cases of haemolytic anaemia in children given *Helmetina-Wurmschokolade*. Three of the children observed in the Mainz

children's clinic were 6, 3½ and 3 years old and these 3 had all already been treated (presumably for enterobiasis) by a similar preparation without ill effects. Four of the 8 children did not exceed the stated dose of 1·6 gm. in 2 days for children aged 3–6 years, 1·9 gm. for those aged 6–10 years and 3·2 gm. for adults. The other 4 took too high a dose and one child, aged 3½, took a whole tablet in the course of 2 days and one day after this dose began to show pallor and a yellowish colour together with general malaise, nausea and repugnance to all kinds of chocolate. The children showed fever and the classical signs of severe, acute, haemolytic anaemia with a fall of haemoglobin to 30 per cent., and of red blood cells to 1·1 million per cmm. Osmotic resistance of the red blood cells was impaired slightly and there was a marked leucocytosis with a marked shift to the left. There was an increase of bilirubin in the blood, but no cyanosis. The children recovered in a few days and the blood became normal in a few weeks, recovery being helped by blood transfusions and treatment. The authors consider that prescription of a substance that can cause these effects should be controlled and that it should not be incorporated in chocolate.

G. Lapage

BROWN, H. W., CHAN, K. F. & FERRELL, B. D. **A Study of the Activity of Chemotherapeutic Agents on Infections of *Syphacia obvelata* and *Aspiculuris tetraptera*.** *Exper. Parasit.* New York. 1954, Jan., v. 3, No. 1, 45–51.

"*Syphacia obvelata* and *Aspiculuris tetraptera*, the pinworms of mice, respond to the anthelmintics commonly used against the pinworm in man. Although *Aspiculuris* appears to be more resistant to several of the anthelmintics than *Syphacia*, both worms appear to be useful in chemotherapeutic tests. Our data indicate that the reduction in the worm burden of infected mice is more sensitive than tests relying on the complete elimination of all worms from the mice."

GOULD, S. E., GOMBERG, H. J. & BETHELL, F. H. **Prevention of Trichinosis by Gamma Irradiation of Pork as a Public Health Measure.** *Amer. J. Pub. Health.* 1953, Dec., v. 43, No. 12, 1550–57. [15 refs.]

Having reviewed briefly the extent, transmission and symptomatology of trichinosis in the United States, the authors give an account of present methods of control with reference to the problem in that country, and their defects are indicated. Recent research work on the effect of ionizing radiation on trichinella larvae *in vitro*, in rat muscle and in pork is then briefly reviewed and it is stated that "it would appear, therefore, that the application of gamma irradiation to raw pork, if systematically carried out, could largely eradicate this disease or reduce it to negligible proportions". Reference is made to a study undertaken by members of the Fission Products Laboratory (to be reported on in detail separately) of the economics of the design, construction and operation of large sources of gamma rays for irradiation of pork in a large pork processing plant, with a view to calculating the possible costs; various aspects of this procedure are outlined. The estimated total annual cost of irradiating 2,000 hogs per day (for 260 days in the year) with the plant under design is \$160,550, which works out at 0·23 cent. per pound of pork. The advantages of irradiation control over other methods of control of trichinosis are discussed in detail.

J. J. C. Buckley

LARSH, J. E., Jr. **Studies in Old Mice to test the Hypotheses of Local and General Immunity to *Trichinella spiralis*.** *J. Infect. Dis.* 1953, Nov.-Dec., v. 93, No. 3, 282-93. [21 refs.]

"The experimental mice were given intracecally one or two doses of *Trichinella spiralis* larvae, while the infected controls received similar stimulating doses orally. To test the immunity, both groups, and controls not infected previously, were given a challenging dose of larvae by mouth. The number of adult worms recovered seven days later was used as the criterion of immunity. Statistical analysis showed that the two groups of mice given the stimulating infection(s) were equally capable of developing acquired immunity."

"According to the conditions of the experimental design, these results exclude the operation of local immunity and demonstrate the role of general immunity to *T. spiralis* in old mice. Evidence is presented in the discussion to support the suggestion that, in this host, the immunity is due to the primary action(s) of antibodies with secondary cellular cooperation."

DEFICIENCY DISEASES

RHODESIA, SOUTHERN. DEPT. OF HEALTH. **Annual Report of the Nutrition Council for 1953** [JONES, E. B., Exec. Officer]. 7 mimeographed pp. 1953, Dec. 28. Causeway: P.O. Box 93.

This report, addressed to the Secretary for Health for the Colony, describes some of the nutritional problems presented by the overwhelming preponderance of maize in the dietaries of the native Africans. Kwashiorkor is present among the children. Goitre and fluorosis are also common. Dr. Baker Jones appears to look after the Nutrition Council as a "one-man show", together with his other duties. In this report he clearly makes the case for a fully-staffed department of nutrition.

Since health and research are now federal affairs, this is the last Annual Report of the Nutrition Council to the Government of Southern Rhodesia. That body appears to have been backward in providing for the work of the Council and it is hoped that the Federal Government will adopt a more realistic attitude to the problem of African nutrition. *R. Passmore*

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. NO. 72. **Joint FAO/WHO Expert Committee on Nutrition. Third Report.** 30 pp. [36 refs.] Geneva: 1953, Dec. [1s. 6d.; \$0.20; Sw.fr. 0.80.] [Issued also as *FAO Nutrition Meetings, Report No. 7.*] [Sales agent for U.K., H.M. Stationery Office.]

Readers who have followed in this *Bulletin* the long series of abstracts dealing with kwashiorkor will find nothing new in this report. However, they may welcome a concise description of the clinical and pathological features of a severe case, a good summary of the agricultural, demographic, economic and cultural factors that constitute the aetiology, and a discussion of the changes in food supply and in dietary customs of mothers and their children, which are necessary to prevent the disease. The report is the work of 18 members of a committee, who are representative of Africa, Asia, Europe, North and South America, Australia, and the Caribbean. Just over 20 years ago kwashiorkor first appeared in medical literature as a

local disease of the Gold Coast: WHO and FAO have now given it the final seal of recognition as a great international disease.

An annex gives a list of 38 names given to syndromes with the same basic characteristics as kwashiorkor.

R. Passmore

FERNANDO, P. B. "Pathogenesis of Portal Cirrhosis." *Ceylon Med. J.* (n.s.) 1953, Nov., v. 2, No. 2, 103-13, 9 figs. on 3 pls. [24 refs.]

This is the text of the Presidential address for 1953 delivered before the Ceylon Medical Association. To show the importance of his subject, Professor Fernando gave the death rate from cirrhosis of the liver per 100,000 of the population of Colombo as 22 in 1949. A corresponding figure for England and Wales was 1.95. The paper is based on a histological examination of the liver in 200 routine post-mortem examinations and the case histories of 192 patients with portal cirrhosis admitted to his wards over the previous decade.

In the post-mortem material, 83 livers showed fatty change of some degree and of these 44 had some connective tissue proliferation. In general, the more extensive the fat, the greater the proliferative changes in the connective tissue. Persistent and prolonged fatty infiltration of the liver is very common in Ceylon.

In 24 of the 192 patients with cirrhosis there was a definite history of an acute illness with jaundice. The liver at biopsy or necropsy was usually coarsely nodulated and microscopically showed hyperplastic nodules, set in the midst of extensive scar tissue. In the remaining 168 patients the onset was insidious and there was no initial jaundice. The liver was finely granular and showed diffuse fibrosis. Normal lobules were not seen and all had been broken up by strands of fibrous tissue. The former group on both clinical and pathological grounds are considered as examples of toxic cirrhosis and the larger second group are described as Laënnec's cirrhosis.

This group in most instances certainly represents the end result of a nutritional disease. As such, portal cirrhosis is a disease that can be prevented and should be eliminated. Portal cirrhosis in Ceylon is thus more than a medical problem. It is a social, economic and administrative problem as well.

R. Passmore

BOL. OFICINA SANITARIA PANAMERICANA. 1953, Suppl. No. 1, 129-49. Tercera edición de la tabla de composición de alimentos de Centro América y Panamá [INSTITUTO DE NUTRICIÓN DE CENTRO AMÉRICA Y PANAMÁ]. [Third Edition of the Table of Composition of Foods of Central America and Panama]

SPRU

BADENOCH, J. & CALLENDER, Sheila, T. Iron Metabolism in Steatorrhea. The Use of Radioactive Iron in Studies of Absorption and Utilization. *Blood*. 1954, Feb., v. 9, No. 2, 123-33, 6 figs.

"The absorption and utilization of radioactive iron has been studied in sixteen patients with steatorrhea and a control group of twelve patients with hypochromic anemia without steatorrhea and three subjects without anemia.

"The patients with idiopathic steatorrhea showed a poor absorption of the test dose given by mouth. This is in keeping with their poor clinical response to oral treatment with iron.

"There is some evidence to suggest that poor absorption in such patients may not be the sole factor involved in the development of the anaemia."

HAEMATOLOGY

EDINGTON, G. M. **Significance of the Target Cell (Leptocyte) in Peripheral Blood Smears of the Gold Coast African.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 401-4, 1 fig. [15 refs.]

The author has made a survey of the target cell incidence in West Africans and has found this to be very high, thus 61 of 165 "healthy" boys aged 8 to 18 years showed target cells in their blood smears, and in 26 of them these abnormal cells amounted to more than 4 per cent. Five hundred and thirty non-sickling persons were compared with 160 sickle-cell trait carriers and with 33 persons suffering from sickle-cell anaemia. There seemed to be a higher incidence of target cells in the younger age groups. The first 2 groups showed a target-cell incidence of 13.8 and 10.6 per cent. respectively, but all the 33 sickle-cell anaemia patients showed target cells. There was no evidence that the target cell was inherited from the parents in sickle-cell anaemia and no patient was found to be suffering from a congenital haemolytic anaemia in whom the peripheral blood film showed many target cells in the absence of sickling. No case of Cooley's anaemia was seen.

H. Lehmann

BANERJI, B. **Haematological Studies in Newborn Infants.** *J. Indian Med. Ass.* 1953, June, v. 22, No. 9, 355-9. [19 refs.]

The haemoglobin level of 23 newborn infants was determined: it was about 1 gm. per cent. higher in the capillary blood taken from the heel than in the cord blood (15.52 as compared with 14.43 gm. per cent.). The red corpuscles were also about 1 million higher per cmm.; this confirms previous observations for which a number of explanations have been offered, one of them being splenic contraction in the newborn with subsequent introduction of blood reservoirs into the peripheral circulation.

H. Lehmann

SINGH, M. M., KAPOOR, S. P. & SINGH, G. **Normal Haematological Values in Young Punjabi Females.** *Indian Med. Gaz.* 1953, June, v. 88, No. 6, 316-21. [17 refs.]

The authors examined 100 Punjabi women of the upper middle class (65 students and 35 hospital nurses). They were between 17 and 24 years old and, although 35 of them were vegetarians, there was an adequate intake of animal protein in the form of milk and eggs. The average haemoglobin value was 13.09 gm. per cent. and the other haematological values also did not differ greatly from those found previously in the Punjab. The serum protein level was 7.20 ± 0.29 gm. per cent. and 5.05 ± 0.26 gm. of this was albumin.

H. Lehmann

MUKHERJEE, C. & MUKHERJEE, S. K. **Studies in Iron Metabolism in Anaemias in Pregnancy. I. Serum Iron.** *J. Indian Med. Ass.* 1953, June, v. 22, No. 9, 345-51, 1 fig. [24 refs.]

[This study begins with a statement which one would like to see substantiated: "The average middle class Indian dietary does not contain

more than 5 to 6 mgm. of assimilable iron, less than half of which can be absorbed, because of the unsatisfactory composition of the diet. . . ." If this really was so, the incidence and severity of iron-deficiency anaemia in India, great as they are, would be even more profound, and in fact one would wonder how the Indian people were able to survive.] Twenty control subjects had a serum iron level of 117 ± 9 mgm./100 ml., 40 normal pregnant women in the last trimester of gestation showed one of 87 ± 14 mgm. Women with anaemia had a greatly reduced serum iron level when it was measured at the same stage of pregnancy: 78 had an iron-deficiency anaemia and the serum iron was 50 ± 20 mgm./100 ml. and 48 had a nutritional macrocytic anaemia with a level of 52 ± 21 mgm.

H. Lehmann

MUKHERJEE, C. & MUKHERJEE, S. K. **Studies in Iron Metabolism in Anaemias in Pregnancy. 2. Iron Binding Capacity and Iron Saturation of Plasma.** *J. Indian Med. Ass.* 1953, Oct., v. 23, No. 1, 1-10, 2 figs. [15 refs.]

The iron-binding capacity and the iron-saturation of the plasma were determined in 50 normal non-pregnant Indian women. The mean unsaturated iron-binding capacity was found to be normal: 227 mgm. per 100 ml. with a range of 182 to 258 mgm. In 10 normal pregnant women the values were normal in the early stages of pregnancy but had significantly increased when the last trimester of gestation had been reached. When there was iron-deficiency anaemia in pregnancy (78 women) these changes were exaggerated and this was also the case when iron deficiency was associated with nutritional macrocytic anaemia (58 women), in 12 women with nutritional macrocytic anaemia without any iron deficiency the values obtained seemed to be those seen in normal pregnancy.

H. Lehmann

CHATTERJEA, J. B. & DAS GUPTA, C. R. **Dimorphic Anaemia.** *Indian Med. Gaz.* 1953, Mar., v. 88, No. 3, 126-44, 8 figs. (5 on 3 pls.). [51 refs.]

Nutritional macrocytic anaemia (NMA) associated with iron-deficiency anaemia was found in 53 of 103 patients with severe anaemia in Calcutta. Forty-eight of them had a mean corpuscular volume of 100 cubic μ and 5 were normocytic (75-100 cubic μ), 47 were hypochromic (mean corpuscular haemoglobin concentration $< 28 \gamma\gamma$). The bone-marrow was normoblastic in 23 patients and "megalo-normoblastic" in 30. Both iron and antimegaloblastic factors were needed in treatment. Some of the causes of the deficiency syndrome were: NMA associated with haemorrhages, hookworm infection, gastro-intestinal disorders such as diarrhoea, steatorrhoea, inadequacy of intake of animal protein and of iron either because of absolute or of relative food lack (pregnancy). This condition is quite different from that where a macrocytic hypochromic blood picture is seen with reticulocytosis and where there is an emission of reticulocytes and of early post-reticulocytes from a bone-marrow working under strain because of peripheral blood loss, and where there is no NMA. [As this is exactly the position in Uganda, where NMA has not been found in Africans, the many parallels drawn between the findings of the authors and those reported from Uganda are based on invalid premises. The paper contains many misprints, most of them trivial, but some of them, such as the report of γ instead of $\gamma\gamma$ mean corpuscular haemoglobin in Table III, are more unfortunate.]

H. Lehmann

CHATTERJEA, J. B. & DAS GUPTA, C. R. **Dimorphic Anaemia.** [Errata.] *Indian Med. Gaz.* 1953, June, v. 88, No. 6, 327.

This is a list of 33 corrections of errata in the paper abstracted above.

H. Lehmann

HIERNAUX, J. La génétique de la Sicklémie et l'intérêt anthropologique de sa fréquence en Afrique noire. [**The Genetics of Sicklaemia and the Anthropological Aspect of its Incidence in Africans**] *Ann. Mus. Roy. Congo Belge.* (8vo., Sci. Homme, Anthrop.) 1952, v. 2, 42 pp., 9 charts & 1 folding map. [30 refs.]

More than 200 families were studied among the Bamosso tribe in Urundi, on the borders of the Belgian Congo and Tanganyika, in which the incidence of sickling is high. The results agree with previous views on the simple inheritance of the trait. There was a slightly higher incidence of infant deaths among the families where both parents had the trait, but the difference is not significant. Among 134 children of parents both of whom lacked the trait there were 10 with sickling, none being expected. Four possible explanations are considered: (1) faulty technique, (2) false declaration of paternity, (3) an alternative recessive mode of transmission, (4) very frequent mutation. All are considered very unlikely. The author is attracted by the hypothesis of variable environmental mutagenic factors, but only mentions this as a very tentative suggestion. He is critical of previous work in which the frequency of sickling has been related to tribal differences on the basis of language, which he does not consider provides an appropriate basis for anthropological classification. Reviewing published work he is unable to find any significant relationship between the frequency of sickling and a number of physical indices. Nor does he find any significant association with a geographical classification. *J. A. Fraser Roberts*

REYNAUD, J. Différenciation par électrophorèse sur papier des hémoglobines humaines des types adulte, foetal et drépanocytaire. [**The Differentiation of Human Adult, Foetal and Sickle Haemoglobins by Filter Paper Electrophoresis**] *C.R. Soc. Biol.* 1953, May, v. 147, Nos. 9/10, 838-41, 1 fig.

The paper electrophoresis of different types of haemoglobin is described. The main difference between this study and those which have appeared from America and Britain is that the author prevents the shifting of the haemoglobin bands, after the electrophoresis has been stopped, by a rapid fixation in a mixture of alcohol and ether, followed by drying. *H. Lehmann*

SINGER, K. & SINGER, Lily. **Studies on Abnormal Hemoglobins. VIII. The Gelling Phenomenon of Sickle Cell Hemoglobin: its Biologic and Diagnostic Significance.** *Blood.* 1953, Nov., v. 8, No. 11, 1008-23, 6 figs. [22 refs.]

When sickle-cell (S) haemoglobin solutions of sufficiently high concentrations are exposed to a continuous stream of CO₂ gas to maintain the pigment in the reduced state, the haemolysates gel. A technique—Involving high-speed centrifugation at 18,000 r.p.m.—is described by which highly concentrated haemoglobin solutions can be prepared and an apparatus is designed for the determination of the gelling phenomenon under standardized conditions. The lowest concentrations of S haemoglobin at which gelling

could still be demonstrated were related to 3 variables: the percentage of S haemoglobin in the concentrate, the type and quantity of the companion pigment in the solution, and the kind of diluent used in the determination. When water or buffer was used as a diluent it was seen that the amounts of S haemoglobin required to elicit gelling were much greater (19-24 per cent.) when the accompanying haemoglobin was foetal (F) haemoglobin, as is the case in sickle-cell anaemia, than when it was adult (A) or (C) haemoglobin as is the case in sickle-cell trait and in sickle-cell-haemoglobin-C disease (9-17 per cent.). The finding that the lowest gelling points of the "anaemia", "trait" and "C variant" haemolysates were distinctly different in water or buffer diluents was extended by showing that dilution with A haemoglobin decreased and with C haemoglobin reduced even further the minimal amount of S pigment required for gelation. The authors conclude that haemoglobins A and C can be utilized in the network formed by the gelling S haemoglobin molecules, but that F haemoglobin seems to be incapable of such interaction.

The fact that the lowest gelling points of the "trait", "C variant" and "sickle-cell anaemia" haemolysates differ, led the authors to devise a diagnostic gelling test. A stock concentrate of 32-35 gm. per cent. as well as 2 aqueous dilutions of 27 and 24 gm. per cent. total haemoglobin are prepared from sickling red cells and examined for gel formation. If gelling occurs in the 24 gm. per cent. haemolysate, the diagnosis of sickle-cell anaemia is established. Should the stock concentrate gel, but gelling not occur in the two dilutions, the haemolysate has been obtained from "trait" erythrocytes (A + S), even if the patient has a severe anaemia; in such instances the anaemia is unrelated to the sickling phenomenon. The presence of "C variant" (C + S) may be suspected if gelling is observed only with the 32 and 27 gm. per cent. solutions, but not with the 24 gm. per cent. concentration. This procedure seems to have great value as a screening method [in a laboratory where a high-speed centrifuge is available], and the authors state that they are studying it now on an extensive scale to evaluate its limitations.

H. Lehmann

COOPER, C. D. & WACKER, W. E. C. The Successful Therapy with Streptokinase-Streptodornase of Ankle Ulcers associated with Mediterranean Anemia. *Blood*. 1954, Mar., v. 9, No. 3, 241-3.

See also p. 605, PESSÔA & COUTINHO, Contribuição ao estudo do sangue na esquistosomose mansônica. I. Anemia. II. Fórmula leucocitária. III. Eosinofilia pós-terapêutica [Study of the Blood in Infection by *Schistosoma mansoni*. I. Anaemia. II. Leucocytic Formula. III. Post-treatment Eosinophilia].

See also p. 526, ALLISON, Protection afforded by Sickle-Cell Trait against Subtropical Malarial Infection. *BRITISH MED. J.*, Sickling and Malaria.

ROCHE, J., DERRIEN, Y., DIACONO, G. & ROQUES, Marie. Sur les hémoglobines humaines au cours des thalassémies mineure (maladie de Rietti-Greppi-Micheli) et majeure (anémie de Cooley). [The Human Haemoglobins in Thalassaemia Minor (Rietti-Greppi-Micheli Disease) and Major (Cooley's Anaemia)] *C.R. Soc. Biol.* 1953, May, v. 147, Nos. 9/10, 771-4, 2 figs.

The authors differentiate not only between adult and foetal haemoglobin, but claim to be able to separate no less than 3 adult and 3 foetal (*i.e.* alkali-resistant) types. The fractions are identified by their different solubilities

at increasing concentrations of phosphate buffer. All types are present both in infants and in adults, the difference is a quantitative change from a mixture in which the foetal haemoglobins predominate to one in which they are present only at a very small concentration. In thalassaemia minima the proportion of foetal haemoglobins is somewhat larger than in normal adults (never more than 10 per cent.), in thalassaemia minor it varied in 8 cases from 18 to 40 per cent., and in 3 cases of Cooley's anaemia the proportion was very high: 90, 93, 96 per cent respectively. In contrast to sickle-cell anaemia where a pathological pigment is found, in Cooley's anaemia no haemoglobin can be demonstrated which is not present also in the normal foetus or adult, the abnormal feature is the distribution of these haemoglobins.

[There seems to be no doubt that with increasing buffer concentrations different fractions of haemoglobin are precipitated, but whether it is justifiable to claim that there are several adult and foetal haemoglobins cannot be decided until the authors have taken into consideration the fact that haemoglobin can crystallize in different forms, which has been demonstrated by PERUTZ and his colleagues (*Nature*, 1952, v. 170, 53). Such different crystals would, of course, precipitate at different salt concentrations.]

H. Lehmann

VENOMS AND ANTIVENENES

HUSAIN, M. M. S. Pathogenic Organisms isolated from the Venom of Poisonous Snakes in Pakistan. *Pakistan J. of Health*. 1953, Oct., v. 3, No. 3, 121-6, 1 graph.

Abscesses are sometimes found around the fangs of snakes from which venom has been extracted; this is especially so in vipers. Furthermore it is a common experience to find that a hot, tense, indurating swelling appears at the site of inoculation in horses being immunized against the venom of vipers and cobras. The reaction may be so severe as to cause the death of horses undergoing immunization for the purposes of the production of antivenene.

Gram-negative bacteria which have been described as "intermediate coliforms" and "paracolons" have been recovered from the pus of the abscesses in the snakes, from the throat swabs of snakes, from the venom of freshly caught snakes, and from the tissues of horses which died after immunization against snake venom.

Late deaths from snake bites are therefore likely to be due to a septicaemia from organisms present in the venom. Cultures from the mouths of non-poisonous snakes did not yield these bacteria.

R. Lovell

FINE, J., GROULADE, J. & EYQUEM, A. Étude par microélectrophorèse sur papier du serum de *Vipera aspis* et *Vipera ursini*. [Study by Paper Microelectrophoresis of the Serum of *Vipera aspis* and *V. ursini*] *Ann. Inst. Pasteur*. 1954, Mar., v. 86, No. 3, 378-82, 3 figs.

The following is a translation of the author's summary:—
In the proteinogramme of *V. aspis* and *V. ursini* a separation of the albumins and of the β globulins into two fractions was observed.

The γ globulins seem to constitute the fraction showing the greatest variations, which is analogous to that which has already been found in man. [See also EYQUEM and FINE below.]

H. J. O'D. Burke-Gaffney

EYQUEM, A. & FINE, J. Les hémagglutinogènes et les hémagglutinines du sang des reptiles. II.—Mise en évidence sur les globules rouges de certains animaux de nouveaux antigènes hétérophiles à l'aide du sérum de *Vipera aspis*. [Haemagglutinogens and Haemagglutinins in the Blood of Reptiles. II. Demonstration by Means of *Vipera aspis* Serum of New Heterophile Antigens in the Red Cells of Certain Animals] *Ann. Inst. Pasteur.* 1953, Dec., v. 85, No. 6, 784–90, 1 fig.

The following is a translation of the authors' summary:—

The study of hetero-agglutinins of *Vipera aspis* serum has permitted the demonstration of antigenic factors common to the red cells of the mare, mule, donkey and ox, and thus the identification of the corresponding hetero-agglutinins as well as their relations with the hetero-agglutinins already discovered. Work now proceeding will permit the determination of their relations with other zoological species. H. J. O'D. Burke-Gaffney

SCHÖTTLER, W. H. A. On the Toxicity of Scorpion Venom. *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 172–8. [15 refs.]

"The toxicity of the venoms of the Brazilian scorpions *Tityus bahiensis* and *T. serrulatus* is extremely variable at different times. The properties of venom extracted from triturated glands are different from those of the pure toxin obtained by milking the live scorpions. Mean lethal doses of from about 0·5 to more than 2·0 mg./kg. were found in the mouse test with the pure venom. There was no difference in toxic activity between the venoms of the two species. The LD₅₀ was the same for subcutaneous and intravenous injection in both of the venoms. The latter observation in conjunction with the symptomatology of scorpion poisoning favors the assumption that the venom is mainly a peripherally attacking neurotoxin. Reasonable volumes of scorpion antivenin should neutralize at least 5 mg. of pure venom."

JAQUES, R. & SCHACHTER, M. The Presence of Histamine, 5-Hydroxytryptamine and a Potent, Slow Contracting Substance in Wasp Venom. *Brit. J. Pharmacol. & Chemotherapy.* 1954, Mar., v. 9, No. 1, 53–8, 3 figs. [18 refs.]

JAQUES, R. & SCHACHTER, M. Sea Anemone Extract (Thalassine) which liberates Histamine and a Slow Contracting Substance. *Brit. J. Pharmacol. & Chemotherapy.* 1954, Mar., v. 9, No. 1, 49–52, 2 figs. [12 refs.]

TANGE, Y. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. II. Über den Giftapparat bei *Pterois lunulata* Temminck et Schlegel. [Morphology of the Poison Apparatus of Japanese Fish, Together with Observations on their Toxicity. II. Poison Apparatus of *Pterois lunulata*] *Yokohama Med. Bull.* 1953, June, v. 4, 178–84, 3 figs.

See also this *Bulletin*, 1954, v. 51, 214.

TOXOPLASMOSIS

VALENTINE, J. C., LANE, W. F., BEATTIE, C. P. & BEVERLEY, J. K. A.
A Proven Case of Congenital Toxoplasmosis. *J. Clin. Path.* 1953,
Nov., v. 6, No. 4, 253-60, 6 figs. & 1 diagram. [34 refs.]

This is the first case of human toxoplasmosis to be diagnosed in Britain by the isolation of the organism, and it is described with great detail in all aspects. It was a congenital infection occurring in a multipara, who had exhibited various abnormalities during pregnancy. She had had persistent vomiting and diarrhoea, accompanied by abdominal cramps; also about the second month of pregnancy she had received a severe insect bite on the leg, which 8 months later was still apparent as a reddish-brown mark on the skin. The nature of the insect remained undiscovered, though it was ascertained that her home was infested with mice and rats, and that she had prepared rabbits for meals for her family. Throughout pregnancy and for 5 years previously she had suffered from a vaginal discharge. The infant was born 2 months early and lived for only 15 minutes. The autopsy revealed gross abnormalities: deep yellow, almost gelatinous peritoneal fluid, enlargement of spleen and liver, deep yellow fluid in the cranium, and extensive changes in the brain and spinal cord—including virtual disappearance of the cerebral hemispheres and yellow necrotic areas in the cerebellum and cervical cord; the eyes showed opacity of the lens, massive haemorrhage in the vitreous and destruction of the retina.

Toxoplasma was found only in the brain and cord; even inoculation of emulsions of spleen or liver into animals failed to produce infection. The chief histological change in the brain was infiltration of lymphocytes, plasma cells and microglial cells, and necrosis of brain tissue, accompanied by the deposition of particles of calcium. Some blood vessels—particularly in the choroid plexus, showed thickening of the walls and obliteration of the lumen. The organisms were scattered throughout the brain substance, lying either free, or in aggregations of 10 to 20 parasites, or intracellularly (1 to 6 per cell); they were most numerous at the edge of the necrotic patches. No pseudo-cysts were found, though these were later demonstrated in subinoculated mice of the second passage. With repeated passage in mice, the infection became more intense, the inflammatory reactions were more acute and the animals died more rapidly—eventually in 6 or 7 days.

A fortnight after delivery, the mother's serum gave a 1 in 7,000 positive dye test and 1 in 32 complement-fixation reaction; 5 weeks later, the former was 1 in 2,000 and the latter 1 in 80. Serological reactions of the father and 2 older children were negative except for a dye test positive 1 in 14 in the father's serum.

P. C. C. Garnham

ROSE, J. R. **Acquired Toxoplasmosis.** [Correspondence.] *Lancet.* 1954,
Mar. 20, 626.

A Lebanese man of 21 who had lived most of his life in Sierra Leone and had kept animals as pets for many years, attended to a favourite chimpanzee which died in 1949. The animal had suffered a long illness ending in paralysis and coma. A few months later, the owner developed a severe febrile illness which lasted for over two months; he was given antimalarial drugs, but recovery was slow and, as the fever abated, he noticed that his eyes were becoming dim.

Despite treatment, the patient's vision deteriorated and in 1951 he eventually sought advice at Moorfields Eye Hospital in London. Here it was found that both maculae showed choroidoretinal degenerative areas which were considered to be due to toxoplasmosis. The complement-fixation test for toxoplasmosis was reported as being "the highest positive which we have had in adults, and it is thought that the infection might be recent".

It is suggested that this may have been an example of a human infection acquired directly from an ape.

H. J. O'D. Burke-Gaffney

THALHAMMER, O. Wert und Grenzen der Toxoplasmosetest. [The Value and Limitations of Tests for Toxoplasmosis] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1953, Oct. 20, v. 110, No. 5, 361-74, 4 figs.

Although serological tests are widely used for the diagnosis of toxoplasmosis, there is still much confusion regarding their reliability and interpretation of the results. In the present paper the author gives a critical analysis of the 3 methods commonly used—the dye, complement-fixation and skin tests, of which the first 2 methods are quantitative, and the third is qualitative.

In the case of the dye test there is considerable variation in the results obtained by different workers, owing to the fact that they employ different dilutions of the sera tested, most of them neglecting the lower titres altogether. The present author starts with a titre of 1 in 4, and regards a positive reaction as evidence of toxoplasmic infection. Positive reactions with sera of low titres are especially important for the detection of latent infections, in which the concentration of antibodies is low. Neglect of low titre reactions results in an underestimate of the incidence of toxoplasmosis in the general population. Conversely, there is an erroneous tendency to regard positive reactions to high titres as evidence of the presence of a clinically recognizable infection. This uncertain position has led to a mistrust of the specificity of the test even when the reaction is positive. However, the specificity of low titre reactions is evident from the close agreement between the dye and skin tests. A common source of error is due to failure to continue the tests with increasing dilutions until a negative reaction is obtained. In this way some symptomless or uncharacteristic infections are easily missed. The author recommends the use of the dye test in dilutions upwards of 1 in 256.

In the complement-fixation test, too, the range of dilutions of the serum is too short. A comparison of this test with the dye test often reveals discrepancies. This is due chiefly to the fact that the complement-fixation reaction becomes positive later and declines to zero earlier than the dye test reaction. Disregard of these peculiarities leads to erroneous conclusions. The complement-fixation test is of special practical importance, as it can be performed in any laboratory equipped for carrying out the Wassermann reaction, whereas the dye test depends on the availability of a strain of *Toxoplasma*.

As regards the skin test, it merely indicates the presence of allergy to toxoplasmic protein. Though the reaction is specific, in breast-fed infants it may be negative in known cases of toxoplasmic infection, therefore it is of diagnostic value only after the age of 2 years. It is noted that injection of the antigen for the skin test may produce antibody formation in healthy persons and a rise in the titre of the serum of infected persons, as revealed by subsequent serological tests. Unless this is taken into consideration the

result of these tests may be misleading. Attention is further drawn to the deterioration of sera, which takes place in haemolytic samples, or with time—during transit or after storage. The results of tests with such sera cannot be relied upon. Other discrepancies in the results arise from the application of different methods in various laboratories. However, if the necessary precautions are taken, the 3 methods show up to 100 per cent. agreement.

Finally, in considering the interpretation of the results of toxoplasmic tests it is noted that positive reactions in a population increase with the age group of the persons tested, and that the titres of the reactions vary in the course of the infection, e.g., positive reactions with low titres are found chiefly in latent and recovered infections, while high titre reactions are characteristic of acute infections. However, the connexion between the clinical picture and the serological tests is not clear. *C. A. Hoare*

BRINGMANN, G. & HOLZ, J. Licht- und elektronenmikroskopische Untersuchungen zum Sero-Farbstest auf Toxoplasmose nach SABIN und FELDMAN. [Light and Electron Microscopic Investigation of the Serum-Dye Test in Toxoplasmosis] *Ztschr. f. Hyg. u. Infektionskr.* 1953, v. 138, No. 2, 151–4, 6 figs.

In previous attempts to interpret the nature of Sabin-Feldman's dye test for toxoplasmosis, it has been suggested that in contact with immune serum the parasites become invested in a membrane which protects them from the action of the specific antibodies. The visible effect of the presence of such a membrane is the impermeability of the cytoplasm to basic methylene blue, thus leaving the toxoplasms unstained in the presence of antiserum. To test the correctness of this theory the authors have carried out examinations, by light and electron microscopy, on toxoplasms subjected to the action of antisera, with controls in normal serum. They found no evidence of the presence of a membrane in the former case, but were able to show that failure to stain the treated parasites was due to the disappearance of the ribonucleic acid from their cytoplasm. Moreover, this reaction proved to be non-specific, since similar results could be produced by the action upon the parasites of antibiotics. [The authors do not mention the work of LELONG and DESMONTS [this *Bulletin*, 1953, v. 50, 64], who attribute the unstainability of toxoplasms to the lytic action of antiserum.]

C. A. Hoare

HELLBRÜGGE, T. & DAHME, E. Experimentelle Toxoplasmose. Bemerkungen zur Arbeit von SCHULTZ und BAUER über Placentarbefunde bei Ratten. [Experimental Toxoplasmosis. Comments on Papers by Schultz and Bauer regarding Findings in Rat Placenta] *Klin. Woch.* 1953, Sept. 1, v. 31, Nos. 38–34, 789–91, 3 figs.

In their experiments on congenital transmission of toxoplasmosis in rats, SCHULTZ and BAUER [this *Bulletin*, 1953, v. 50, 456] found pseudocysts of *Toxoplasma* in sections of the placenta of pregnant females 4 days after their intracerebral inoculation with toxoplasm-suspension. The infection in these rats was latent, and only isolated parasites could be detected in their tissues when they were killed one day before parturition.

The present study was undertaken with the view to verifying the results obtained by Schultz and Bauer. During the last third of the pregnancy period rats were inoculated intravenously with heavily infected peritoneal exudate of mice. At different intervals after infection the rats were killed,

and the foetuses, uteri and placentae were removed for histological examination and for subinoculation into other animals. Although numerous stained (haematoxylin-eosin) serial sections of this material were examined no parasites could be detected in them with certainty. In this connexion it is pointed out that the differentiation of the toxoplasms from the proliferating cells of the placenta and foetus presents great difficulties. Moreover, in the placenta were found numerous cells containing glycogen and exhibiting various degenerative nuclear changes. Such cells may be enlarged and surrounded by giant cells, giving rise to cyst-like structures which are easily mistaken for toxoplasmic pseudocysts. However, this interpretation was excluded by the finding of similar structures in the placenta of normal (control) female rats. The appearance of these histological elements simulating toxoplasmic pseudocysts is shown in the accompanying figures.

However, the subinoculation of suspensions of the placentae and foetuses into mice revealed the presence of toxoplasms in the placenta from 1 hour to 8 days after inoculation of the female rats, while in the foetus the parasites made their first appearance after 48 hours. Since in the infected placentae there were no histopathological changes due to the presence of toxoplasms, it is assumed that the latter circulate in the maternal blood.

In view of the fact that the toxoplasmic infection in rats is usually latent, with parasitaemia lasting only up to 4 weeks, after which the parasites are restricted to the brain, the authors doubt that the intracerebral inoculations of rats—as described by Schultz and Bauer—could have resulted in intra-uterine transmission to the foetuses, while the finding by them of pseudocysts in the placenta would appear to be due to misinterpretation of the cellular changes in the placenta noted above.

C. A. Hoare

GRÖNROOS, P. **Antibiotics and Experimental Toxoplasmosis. Polymyxin B-Sulfate, Bacitracin, Terramycin, Aureomycin and Sulfa in Experimental Toxoplasmosis.** *Ann. Med. Exper. et Biol. Fenniae.* Helsinki. 1953, v. 31, No. 4, 374-7. [11 refs.]

"Sulfa (Elkosin, Ciba) has a good effect on experimental toxoplasmosis in embryonated hens' eggs. The chickens, however, remain Toxoplasma carriers. Aureomycin and terramycin have a weak effect, but bacitracin and polymyxin B-sulfate are without effect on toxoplasmosis."

DERMATOLOGY AND FUNGUS DISEASE

ALEIXO, J. O coaltar na terapêutica externa do pênfigo foliáceo. (Resultado e indicações atuais de seu emprêgo.) [Coal Tar Externally in Treatment of Pemphigus Foliaceus] *Med. Cirurg. Farmacia.* 1953, June, No. 206, 252-5, 2 figs.

Pemphigus foliaceus may be seen as early and fairly localized and benign, or generalized as a serious disease. For the former a 5 per cent. coal tar ointment is of great benefit. The severer types occur in 3 forms: herpetiform, exfoliative bullae and exfoliative pustules. For herpetiform cases coal tar in ointment form is best; for the other 2 types coal tar with a basis of Unna's "permeable varnish". In order not to interfere unduly with cutaneous respiration not more than one-third of the skin surface

should be treated at one time. For the hairy scalp 1 per cent. coal tar, as Liquor carbonis detergens, is used. For treatment of chronic squamous or scabbing lesions the following formula is recommended: coal tar 3·00, oxide of zinc 20·0, vaseline 100·0. For the more extensive and severer lesions Unna's casein varnish is the basis and to it are added successively, lanolin 75·0, liquid vaseline 75·0, Glycerin 70·0, oxide of zinc 5·0, phenol 5·0, and coal tar in a proportion of 3 to 5 per cent., the last as a maximum.

H. Harold Scott

HOWLES, J. K., KENNEDY, C. B., GARVIN, W. H., BRUECK, J. W. & BUDDINGH, G. J. **Chromoblastomycosis. Report of Nine Cases from a Single Area in Louisiana.** *Arch. Dermat. & Syph.* 1954, Jan., v. 69, No. 1, 83-90, 1 fig. [12 refs.]

The authors have identified 9 cases of chromoblastomycosis in the area of New Orleans over a period of 2 years, although a total of only 12 cases of the disease had been recorded for the whole of the United States during the preceding 38 years. The observed incidence of chromoblastomycosis depends upon the diagnostic acumen of the physicians concerned, and when they are better acquainted with the characters of the disease and apply mycological methods for its diagnosis, more cases are brought to light. In the meantime, the possibility of chromoblastomycosis should be kept in view in connexion with all chronic, verrucose, granulomatous diseases of the skin, especially in warm climates.

In their examinations, the authors applied the following scheme: (1) Scrapings of the lesions were mounted in 20 per cent. caustic potash solution and examined microscopically for the fungal parasite, all species of which are seen as dark brown, oval, septate cells measuring from 6 to 12 μ in longer axis. (2) Scrapings were planted for culture on 'Sabouraud's' glucose agar and incubated at room temperature. (3) Scrapings were suspended in isotonic saline to which penicillin, 20 units, and streptomycin, 100 μ gm., had been added per ml., and injected into the yolk sac of 6- to 8-day chick embryos. After 4 to 6 days' further incubation, specimens of the yolk were mounted in caustic potash solution and examined microscopically for the brown, septate cells of the fungus. (4) Tissue taken from the lesion by biopsy was studied in section for the characteristic histology of the disease.

Clinical and pathological data of the 9 cases are set out in tabular form, and show that 6 of the patients belonged to the white and 3 to the black race; 7 were males and 2 females (both white). The stated occupations had little evident bearing on the epidemiology except that in 4 it entailed occasional contact with timber. The duration of the disease, when seen by the physician, ranged from 6 or 8 months in one case to 20 years in another; in 6 cases it was from 2 to 5 years and in one 6 years. The lesions were situated on the hand in 3 cases, on the arm or elbow in 4 and on the leg or foot in 2. The relatively few infections on the foot may be attributed to the use of footwear, protective against trauma and gross contamination. The type of lesion was an elevated plaque measuring from 1 or 2 inches up to about 6 inches in diameter, with a verrucose and often scaly surface, sometimes crusted and presenting discharging sinuses; or verrucose nodules, often multiple, based on areas of scar tissue, sometimes with discharging sinuses, also shallow crusted ulcers.

The species of fungus cultivated was *Phialophora pedrosoi* in 7 cases, *P. verrucosa* in 1 and no culture in 1. The diagnosis of chromoblastomycosis

was positive by culture in 8 cases, by biopsy and histology in 7 and by microscopy of wet preparations in 8.

In treatment, iodide therapy was applied unsuccessfully to 2 cases, X-ray therapy was unsuccessful in 2 cases and the results from 2 others are still awaited. Surgical excision of the lesion and skin grafting effected cure in 2 cases; this is the method of choice when the disease is not too extensive.

J. T. Duncan

FRIEDMAN, Lorraine & CONANT, N. F. **Immunologic Studies on the Etiologic Agents of North and South American Blastomycosis. I. Comparison of Hypersensitivity Reactions.** *Mycopathologia*. The Hague. 1953, Oct. 31, v. 6, No. 4, 310-16. [18 refs.] **II. Comparison of Serologic Reactions.** *Ibid.*, 317-24. [14 refs.]

I. In a previous report, CONANT and HOWELL [this *Bulletin*, 1944, v. 41, 67] proposed the transfer of *Paracoccidioides brasiliensis* to the genus *Blastomyces*, as *Blastomyces brasiliensis*, on the ground that the difference in the mode of budding—unipolar or multipolar—of the yeast forms of *Blastomyces dermatitidis* and *Paracoccidioides brasiliensis* were not constant and should be related more to differences of species than to genera.

The present report deals with a study of the antigenic relationship of the 2 species as revealed by cross-sensitivity tests on man or animals specifically sensitized by either of the species, and by cross-serological tests.

For the dermal sensitivity tests, guineapigs were specifically sensitized by infection with *B. dermatitidis* or *P. brasiliensis*, and the tests were made by intradermal injection of a filtrate of cultures on a synthetic broth medium prepared according to Smith's method for coccidioidin, and also a suspension of the intact yeast form cells of the fungi. Animals specifically sensitized against *B. dermatitidis* showed cross sensitivity to *P. brasiliensis* which was most marked when a strong test injection was used, but cross reactions became fewer as the test antigen preparations were diluted. The results obtained with the filtrate and with the whole yeast form antigens were similar. Animals sensitized against *P. brasiliensis* also reacted against the antigens of both species but the cross reactions were less evident when the yeast form antigen was used. Tests on 6 persons suffering from North American blastomycosis (*B. dermatitidis*), who were sensitive to *B. dermatitidis*, showed that 2 reacted to the yeast form of *P. brasiliensis* at 1 in 1,000 and 4 at 1 in 100, but the heterologous reactions were much smaller than the homologous. Cases of South American blastomycosis were not available for the test but LACAZ (*Rev. Hosp. Clin.*, 1948, v. 3, 11) had already reported that in tests on 25 patients with this disease, 18 reacted to paracoccidioidin and 5 of these 18 also reacted to blastomycin, but none reacted to coccidioidin.

II. For the serological tests the complement-fixation reaction was used. Rabbits were immunized by repeated large injections of an extract of the yeast form of the fungi obtained by treating suspensions with sonic oscillations. The serum of these animals, and serum from human cases of both diseases, were tested against 3 types of antigen preparation; the culture filtrate and the yeast cell suspension, already referred to, and the protein fraction extracted from the yeast form after disintegration of the cells by sonic oscillation. Tests with the rabbit sera showed marked cross reactions, the titre for the heterologous antigen being almost as high, if not as high, as for the homologous antigen in many tests.

The serum of 11 out of 20 patients with North American blastomycosis

gave complement fixation with the homologous antigens but only 2 of the 11 reacted with the *Paracoccidioides* antigens. However, the antigenic power of *B. dermatitidis* is relatively weak and the antibody response in infection is low even for the homologous antigen, and may be undetectable for heterologous antigens. On the other hand, a high titre of antibody is frequently found in South American blastomycosis and this may be reflected in a greater number of cross reactions, although it is not an established rule. Of 11 sera from cases of South American blastomycosis which reacted with the homologous antigens, 5 also reacted with those of *B. dermatitidis*. There was no correlation between the titres for the homologous antigens and those for the heterologous antigens.

The evidence from both dermal sensitivity tests and the complement-fixation reaction indicates a close antigenic relationship between *Blastomyces dermatitidis* and *Paracoccidioides (Blastomyces) brasiliensis*.

In preparing the extracts of the yeast phase cells by sonic oscillation, it was noticed that a period of 5 minutes' oscillation was sufficient to produce an opaque supernatant in the case of *P. brasiliensis* as against 20 minutes necessary in the case of *B. dermatitidis*. This seems to confirm the opinion of MACKINNON and VINELLI [this *Bulletin*, 1950, v. 47, 84] that the cell wall in *P. brasiliensis* is very much thinner than that of *B. dermatitidis*, an important distinguishing character.

J. T. Duncan

TROPICAL OPHTHALMOLOGY

REGNER, R. Die Arbeit der Trachomstation in Disful (Iran). [**The Work of the Trachoma Station in Disful (Iran)**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 133-7.

The English summary appended to the paper is as follows:—

"Trachoma is pandemic among the population of Disful, Iran, 80,000 inhabitants. The disease is spread by hibernating nomadic tribes. Three years ago a medical station with specialists and male native help was founded for individual treatment of trachoma cases and general prophylactic measures. Results are promising."

TOLEDO, S. DE A. & DE AZEVEDO, P. A. Carta geográfica da incidência do tracoma no Estado de São Paulo. [**Geographical Chart of the Incidence of Trachoma in the State of São Paulo, Brazil**] *Arquivos de Hig. e Saúde Pública*. S. Paulo. 1952, Dec., v. 17, No. 54, 559-682. English summary (9 lines).

ARAKAWA, S., KITAMURA, O., MITSUI, Y. & TANAKA, C. Untersuchungen über Trachom. 3. Mitteilung: Virus-Neutralisation im Menschenversuch. [**Investigations on Trachoma. 3. Virus Neutralization in Human Experiments**] *Arch. f.d. gesamte Virusforschung*. 1953, v. 5, No. 3, 208-12, 1 fig. [10 refs.]

Typical acute trachoma was produced in a human volunteer by the conjunctival instillation of trachomatous material which had been incubated with penicillin, and it was therefore concluded that penicillin had no effect upon the virus. In earlier work the adaptation of trachoma virus to passage

in mouse brain has been reported [this *Bulletin*, 1951, v. 48, 499]. An immune serum prepared by the inoculation of rabbits with mouse-adapted virus was mixed with a centrifuged extract of human trachomatous material and instilled into one eye of a human volunteer; the other eye was inoculated with a similar mixture containing normal serum. The first eye showed no abnormality over a period of 18 days, whereas typical acute trachoma developed in the other eye. The results therefore show that trachoma virus was neutralized by an antiserum to the mouse-adapted strain. An identical result was obtained in a second volunteer.

D. J. Bauer

BIETTI, G. B. & FERRARIS DE GASPARÉ, P. F. Résultats éloignés après traitement en série sulfamido-antibiotique du trachome en milieu surendémique. [Late Results of Treatment of Trachoma in a Hyper-endemic Area by Combined Sulphonamide and Antibiotic Therapy] *Rev. Internat. du Trachome*. 1954, v. 31, No. 1, 47-59.

The authors, from Parma, Italy, first discuss the general question of the treatment of trachoma with sulphonamides and antibiotics, with special reference to the question of ultimate cure, relapse, re-infection and the possibility of spontaneous healing. After quoting the results of previous work by themselves and others, they describe the end-results of series of cases treated for various periods.

For example, 892 Arab schoolchildren, aged 6 to 10 years, from Fawar and Arroub in Palestine were treated for 3 months in three series of 3 weeks each with sulphonamides orally and 1 per cent. aureomycin ointment locally: of these, 567 were examined 16 months after the end of treatment. It was then found that 370 were completely healed, 81 nearly healed and 116 improved. Among the healed, there were subsequently 27 certain relapses (7.29 per cent.) and 13 doubtful relapse (3.52 per cent.): at the same time, 24 of the nearly healed became entirely healed, as did 8 of those who previously had active trachoma.

Comparable results were found in a series of 102 Arab children from Gaza.

By comparison, re-examination was made of 43 children with trachoma treated in Sardinia in 1942 with repeated course of sulphonamides only, who had been believed to be cured. After 11 years it was found that 34 were in fact healed, without scars, but 9 still had active trachoma, so that the rate of relapse or re-infection was 20.9 per cent. [In the English summary to the paper, several lines have been omitted and this last observation reads "in a group of 102 Arab children treated in Sardinia in 1942".]

Taking into account the fact that the patients had received no further treatment or control and that they lived in a highly endemic area, the authors consider that the results confirm the value of "this periodical treatment for elimination of trachoma in such countries".

Finally they point out that the incidence of spontaneous healing was very low.

H. J. O'D. Burke-Gaffney

CHAMS. L'électro-coagulation du trachome. [Electro-Coagulation in Trachoma] *Rev. Internat. du Trachome*. 1954, v. 31, No. 1, 1-46, 105 figs. (89 coloured) on 28 pls. [24 refs.]

MISCELLANEOUS DISEASES

LEWIS, S. M. & LURIE, A. Onyalai. A Clinical and Laboratory Survey.
J. Trop. Med. & Hyg. 1953, Dec., v. 56, No. 12, 281-9. [25 refs.]

Onyalai is described as a bleeding disease characterized by the development on mucous surfaces of bullae containing blood, by thrombocytopenia, and by a prolonged bleeding time. For the purpose of their investigations the authors selected 32 cases having the following features: (a) spontaneous bleeding from mucous membranes or purpura; (b) blood platelets less than 10,000 per cmm.; (c) anaemia and leucocyte count not out of proportion to the amount of bleeding; (d) no pathological cells in blood or bone-marrow; (e) normal coagulation time and prothrombin content; (f) haemorrhagic bullae in the mouth.

Among the 32 patients, 11 had, and 21 had not, a previous history of the disease. In 20 of the 21 new cases an apparently complete recovery followed within 2 months of the onset of the illness.

Haemorrhagic bullae were recorded on the conjunctiva and on all parts of the mucous membrane of the oral cavity. In all cases the bleeding time was prolonged, capillary fragility was increased, and clot retraction and prothrombin utilization were impaired.

Treatment with vitamins A, B, C, K, and P and with koagamin, penicillin, aureomycin and antihistamines was ineffective, but blood transfusions were of value during bleeding episodes. Cortisone was also found to be of value though its effects in cases in the series are not recorded. It is suggested that splenectomy would be a rational procedure in certain cases of this disease as in idiopathic thrombocytopenia in non-tropical regions.

The various theories relating to the aetiology of onyalai are discussed. The conclusion is reached that it differs in no significant respect from idiopathic thrombocytopenia and that it is therefore, unjustifiable to classify it as a separate entity.

[This is a report of a very comprehensive piece of work and is an important contribution to knowledge of the subject.] *A. W. Woodruff*

PARASITOLOGY: GENERAL

CHANDLER, A. C. The Relation of Nutrition to Parasitism. *J. Egyptian Med. Ass.* 1953, v. 36, No. 9, 533-52. [61 refs.]

This paper gives a useful survey of the relation of the nutrition of the host to protozoal, helminthic and arthropod (ectoparasite) infection, and should be read in the original for details. The author shows that diet affects parasitism in two ways: (1) by the effect on the parasite (by retarding or stimulating growth, or actually poisoning the invader), and (2) by the effect on the defence mechanisms (by interfering with the production either of gamma globulin or of phagocytes). Attempts to pin-point the exact constituent of the diet responsible for a particular action are usually unsatisfactory because of the metabolic changes possible inside the body and the inter-relationships of the various substances, particularly amino-acids. In young animals much of the protein intake goes to growth—there is less available for immunity production and so such animals tend to suffer more from the effects of parasitism than older ones; equally, if the diet is poor, development of resistance is retarded whatever the age of the host.

Examples are taken from infections due to animal parasites to illustrate special sensitivities.

P. C. C. Garnham

CHANDLER, A. C. **A Comparison of Helminthic and Protozoan Infections in Two Egyptian Villages Two Years after the Installation of Sanitary Improvements in One of them.** Amer. J. Trop. Med. & Hyg. 1954, Jan., v. 3, No. 1, 59-73. [11 refs.]

During 1948 to 1951 the International Health Division of the Rockefeller Foundation, in cooperation with the Egyptian Ministry of Public Health, made a preliminary survey of health conditions in a group of 5 villages close to Cairo, and then introduced sanitary improvements and health services into 4 of them. The fifth village was left as a control. This paper reports an investigation made in 1952 in the control village and in an improved village, Sindbis, aimed at obtaining data on the effectiveness of the sanitary improvements after 2 years' functioning. Sindbis had been provided with bored hole latrines, pump wells, fly control by residual insecticides, a refuse disposal service and general preventive medical services. It had also a Health Centre which treated all cases of hookworm, *Ascaris* and *Schistosoma* infections detected in the original survey. Little reliable information could be obtained about the usage of the latrines provided in Sindbis, but the pump wells were used exclusively, though workers in the field continued to drink canal water. For the purposes of this survey 25 specimens of stools were examined from persons of each sex in each of the age groups 1-4, 5-9, 10-19, 20-39 and 40 upwards from each village.

Ascaris was the most prevalent helminth infection, followed by *Trichostyngylus*, *Ancylostoma* and *Hymenolepis nana* in that order; only a small number of other intestinal helminths was recorded. In Sindbis the general incidence of ascariasis was 50 per cent. compared with 62 per cent. in 1950, and with 76 per cent. in the control village where the worm burden also was estimated to be $2\frac{1}{2}$ times as great in all age groups combined and even more in the 1-4 group. It is believed that the improvement resulted from the sanitary installations and that in their absence the reduction following the treatment of infected persons in 1950 would have returned to the pre-treatment level in 5 to 8 months. A low incidence of light *Ancylostoma* infections was recorded which was, however, higher in the control village. Only very light infections were acquired in the village, the heavier infections all being found in workers in the fields. The incidence of *Trichostyngylus* infections was high in both villages but the infections were very light. The infection, though unimportant, reflected the close association with animals in houses. Scanty infections with *Enterobius* and *Trichuris* were noted and also with *Schistosoma mansoni* and *S. haematobium* because the methods of treatment of the samples were not suitable for the detection of schistosome ova. *H. nana* was found in 7 per cent. of people examined and was more common in Sindbis than in the control village. It is probably not transmitted by human faecal pollution but by contamination of food by rat and mouse droppings. This parasite was strikingly more common in persons under 16 years of age, probably an age-immunity effect. Ten infections with *H. diminuta* were recorded, distributed in all age groups.

Examination for protozoa was limited to a 10-minute search of each stool specimen and it is estimated that the incidence reported probably represented only 60 per cent. or less of the existing infections. The general infection rates in the 2 villages were similar, indicating that sanitary improvements had not yet affected the incidence. *Entamoeba histolytica* infection in the various age groups ranged from 43 to 60 per cent. All the common

intestinal protozoa were recorded, and it was noted that *Giardia* showed a markedly heavier incidence at ages below 19 years, probably owing to age immunity. [These results are comparable with those of ELDON-DEW, who studied similar conditions in a slum area and in a new housing estate in Durban (this *Bulletin*, 1954, v. 51, 225). Better housing produced an immediate reduction of helminths, but little change in protozoal infection.]

T. H. Davey

CHERNIN, E. Problems in Tropical Public Health among Workers at a Jute Mill near Calcutta. I. Malaria in the Labor Population. *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 74-93, 6 figs. II. A Study of Intestinal Parasites in the Labor Force. *Ibid.*, 94-106, 3 figs. III. Intestinal Parasites in the European Supervisory Staff and their Foodhandler Servants. *Ibid.*, 107-11.

In one of the jute mills in Calcutta, that belonging to the Ludlow Jute Company, a series of studies were made in 1951-52, aimed at assessing the relative importance of the various parasitic infections prevalent in the labour force. The workers numbered between 6,000 and 7,000, about half of them of local origin and domiciled in neighbouring villages, and half being immigrants, mostly unaccompanied by their families, who numbered about 4,500 with their dependants. These latter rented accommodation in the Company's labour lines, which was well built, provided with sanitation and was sprayed thrice annually with DDT. Village housing was much inferior, without sanitation and with water supplies exposed to gross contamination. An adjacent mill with a labour force of 2,300 was used for comparison.

I. The first paper deals with a year's study of malaria. Just before the annual malaria increase in 1951 a survey among children in schools and in the labour lines showed a spleen index of 1.8 and a zero parasite index. No difference was noted between the 2 labour lines. A resurvey just after the peak of the malaria rise showed an increase in the spleen index in the control lines from 3.6 to 14.9 and in the parasite index from 0 to 58.1. In Ludlow, however, the comparable figures were 3.5 to 3.6 and 0 to 1.3. The mean catch of anophelines in the sprayed Ludlow compound was 0.2 per 15 minutes per house, as compared with 3.0 in the control compound and 6.1 in the villages. During the year 2,655 malaria infections were diagnosed in Ludlow mill, the peak incidence being 84.4 per 1,000 in November. The malaria rate in the villages was one-third higher and in the control labour lines was twice as high as in the Ludlow compound. Malaria caused 12.9 per cent. of the 55,721 man-days lost through illness in the Ludlow mill, and during the most malarious month claimed 25 per cent. of time lost. Since 1949 proguanil prophylaxis has been available weekly to all Ludlow workers but less than 10 per cent. accept it and many of these take it irregularly. Despite control in the mill area malaria in the workers still constitutes a problem because they usually sleep in the open during warm weather and they visit villages and their provincial homes. The investigation, while indicating the relative efficacy of the malaria control measures at Ludlow, illustrates the limitations of control in part of an area otherwise uncontrolled.

II. The second paper reports the results of a survey of intestinal parasitic infection in 750 Ludlow mill workers. The survey sample was arranged to include the proportions of the sexes and of religious and provincial groups indicated by the employer's census figures. Only one stool specimen was examined from each person. One or more parasitic organisms were found in 92.5 per cent., 73.5 per cent. being infected with protozoa and 76.1 per

cent. with helminths. Protozoal infections were higher among females and Hindus and helminth infections amongst males and Muslims. In Hindus the ascariasis and trichiniasis incidences were 3·0 per cent. to 6·5 per cent., respectively, and in Muslims 29·9 and 46·7 per cent. Differences between the village and mill compound rates were related primarily to religious affiliation. The infection rates reported in this survey are higher than in other surveys carried out in Calcutta, which were on a predominantly urban population while this was on a rural population. Tables show the infection rates for various parasites according to sex, age and religious groups. The sanitary state of Muslim houses was inferior to that of Hindus, and sanitation in the mill compound was vastly superior to that in villages where facilities were almost non-existent, though personal hygiene was surprisingly good. Nevertheless, the incidence of individual and grouped infections was roughly the same in workers from both residential areas, presumably because of infection contracted prior to taking up residence in the mill compound and during visits and leaves. It is concluded that focal sanitation cannot be effective when the sanitary standards of the surrounding environment are low.

III. A similar survey of intestinal parasites was conducted among the members of the mill's supervisory staff, their families and their food-handling servants. One-third of the senior staff were Indians living under the same conditions as the non-Indian staff. Protozoal infections were found in 39 per cent. of the staff and their families and in 83 per cent. of their servants. *Entamoeba histolytica* was equally prevalent in both groups and the rates were of the same order as in the mill workers. The incidence of helminth parasites, however, differed markedly between the supervisory group (under 1 per cent.) and their servants (80 per cent.). The incidence of intestinal parasites in the former group varied according to the country of origin and length of stay in the tropics. The servants, whose educational and living standards were higher than those of the mill workers, showed a parasite incidence between those of the supervisory group and of the mill workers. The results demonstrate that it is possible for persons from Western countries to live under tropical conditions with no great risk of intestinal parasitic infection.

T. H. Davey

BEARUP, A. J., LAWRENCE, J. J. & HEYDON, G. A. M. **The Incidence of Parasitic Infections in New South Wales.** *Med. J. Australia.* 1949, July 2, v. 2, No. 1, 7-10. [16 refs.]

One stool from each of 2,365 soldiers who had never been out of Australia was searched for protozoa by direct microscopical examination, and in some cases by means of a zinc sulphate flotation technique. The incidences of intestinal protozoal infections disclosed by the examinations were:—*Entamoeba histolytica* 1·31 per cent. (roughly half were small-cyst-producing types); *E. coli* 8·96 per cent.; *Endolimax nana* 5·66 per cent.; *Iodamoeba bütschlii* 0·13 per cent.; *Dientamoeba fragilis* 0·04 per cent.; *Giardia intestinalis* 6·98 per cent.; *Trichomonas hominis* 0·04 per cent.; *Chilomastix mesnili* 0·08 per cent.; and "not identified" 0·17 per cent. Double, triple, and one quadruple, infections with these parasites were noted. Similar examinations of 210 persons who had been out of Australia gave comparable figures for *E. coli*, *E. nana* and *G. intestinalis*; these apparently were the only intestinal protozoa recognized in them. The zinc sulphate flotation technique was employed on 286 specimens, and this gave rather higher figures for some infections, notably for *E. coli*. The authors point out that a single stool examination does not give a true figure of

incidences; from the literature they derive various mathematical factors which, it has been suggested, bring the figures to an approximation of the truth, and with the application of these they conclude that the incidence of amoebiasis in the male population of New South Wales is about 3 per cent. This incidence is now lower than that determined by some previous workers 30 years ago [but the imponderables of skill and experience in the examination are not mentioned].

Single specimens of the stools of 416 children in a Sydney hospital were then examined for protozoal and for helminthic parasites; the incidences of the former were found to be very similar to those in adults, though *G. intestinalis* was rather higher. The examination for helminth infections was done by means of Lane's direct centrifugal flotation method. Threadworm infection was found in 13, whipworm in 1, and *Trichostrongylus colubriformis* in another of the children [this method of examination obviously cannot yield figures of any real significance]. [See also this *Bulletin*, 1953, v. 50, 812.]

A. R. D. Adams

BURROWS, R. B. Intestinal Parasitic Infections in Military Food Handlers.
U.S. Armed Forces Med. J. 1954, Jan., v. 5, No. 1, 77-82. [11 refs.]

Single stools from 1,500 military food-handlers were examined by direct microscopy and by a concentration technique for protozoa. Representatives of all the usual intestinal protozoa were found; hookworm, roundworm, whipworm; *Strongyloides* and *Hymenolepis nana* infections were also noticed. The actual percentages of incidence of *Entamoeba histolytica* infection in the Army group examined (1,246 men) were 3·4 per cent., in the Air Force group (165 men) 6·7 per cent., and in the Marine Corps group (89 men) 1·1 per cent.; the calculated or theoretical percentages on these figures are given as 8·2, 16·3 and 2·7 per cent., respectively, and 8·7 per cent. for the combined groups. The similarly calculated percentages for the combined groups were *E. coli* infection in 35·2 per cent., *Endolimax nana* in 30·6 per cent., *Iodamoeba bütschlii* in 2·1 per cent. and *Dientamoeba fragilis* in 0·77 per cent. It was noticed that those who had served overseas more commonly were infected than those who had not; the rates for the 1,500 members of the forces examined are considered to be higher than those for civilians in the U.S.A.

A. R. D. Adams

WILKS, N. E. & SONNENBERG, B. Intestinal Parasites in Food Handlers returned from Korea. *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 131-5. [10 refs.]

Army personnel returned from Korea and destined for work involving the handling of food were considered to be possible conveyors of intestinal parasitic infections, though none of those under suspicion had symptoms suggestive of such infections. Accordingly, some 3 stools from each of 287 of them were examined by means of a number of techniques to reveal the presence of protozoal or helminthic parasites. An analysis of the findings, which are detailed in a series of tables, showed that 140 (48·8 per cent.) of the 287 men harboured intestinal parasites of some kind. An *Entamoeba histolytica* infection was found in 49 (17·1 per cent.); *Giardia intestinalis* in 12 (4·2 per cent.); *Ascaris lumbricoides* in 24 (8·4 per cent.); hookworm in 14 (4·9 per cent.); and *Strongyloides stercoralis* in 5 (1·7 per cent.). Infections with the common protozoa usually held to be of no pathological significance were also found; the other worm infections detected were whipworm and *Hymenolepis nana* (1 case). The fact that *E. histolytica* was

sometimes found in only one of 3 specimens of stool examined re-emphasizes the importance of multiple stool examinations to detect this parasite. Those found to harbour it, and other infections susceptible to treatment, were appropriately dealt with before being allowed to continue their food-handling duties.

A. R. D. Adams

WESTPHAL, A. Zur Diagnose der *Pneumocystis carinii*-Infektion des Menschen. [Diagnosis of *Pneumocystis carinii* Infection in Man] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Oct., v. 4, No. 4, 549-54, 3 figs.

Since the elucidation of the aetiology of interstitial pneumonia of young infants [this *Bulletin*, 1952, v. 49, 908], cases of infection with *Pneumocystis carinii* have also been found in Germany. In the present paper an account is given of the parasitological diagnosis of this infection, based on 9 cases. The best results are obtained in dab smears of lung tissue, dried in the air and stained by Giemsa's method after fixation in methyl alcohol for 3 minutes. In these preparations it is seen that the alveoli and bronchioles of infected lungs are filled with masses of small amoeboid parasites, which multiply by binary fission. In sections it is seen that they are surrounded by a foam-like coagulation zone, thought to be produced by the parasites. In addition to the amoeboid forms, the parasites have an encysted stage which, when mature, contains 8 daughter individuals, while in the earlier stages there may be 1, 2 or 4 young forms. The octonucleate cysts represent the most important stage for the differential diagnosis of *Pneumocystis* infection.

In sections of lung tissue the detection of the parasites and their cysts is more difficult. The best results are obtained by fixation in formol or "sublimate-alcohol" [Schaudinn's fluid?] and staining with Böhmer's haematoxylin for 30 minutes, without differentiation or counterstaining. Like other protozoa, *Pneumocystis* is Gram-negative. This staining reaction serves to distinguish this parasite from Gram-positive yeasts which have also been reported from human lung, and obviously represent contaminants. The appearance of *Pneumocystis* in smears and sections is illustrated in a number of photomicrographs.

C. A. Hoare

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Cova GARCIA, P. Llave para la clasificacion de los Dipteros mas comunes en Venezuela. [Key to the Common Families of Diptera of Venezuela] [Presented at II Congreso de Ciencias Naturales y Afines, Caracas, 22-30 Sept. 1951. Cuaderno No. 9.] 61 pp., 57 figs. 1953. Caracas: División de Malariología, Ministerio Sanidad y Asistencia Social.

This is a key to the families only of the order Diptera. It is based on several standard works and is profusely illustrated with figures from them. The sources of the figures are but briefly noted in the bibliography.

D. S. Bertram

MICKS, D. W. & BENEDICT, A. A. **Infrared Spectrophotometry as a means for Identification of Mosquitoes.** *Proc. Soc. Exper. Biol. & Med.* 1953, Oct., v. 84, No. 1, 12-14, 2 figs. [12 refs.]

Serological tests and the analysis of the free amino-acids [this *Bulletin*, 1952, v. 49, 451] in the blood of 7 species of mosquitoes have been used by other authors as a means for identifying mosquitoes; this paper describes the use of infra-red spectrophotometry for this purpose.

In the laboratory, the infra-red absorption spectra of aqueous extracts of *Culex molestus*, *C. fatigans* and *Aëdes aegypti* gave sufficiently consistent differences to enable the identifications to be made. The experiment was conducted with unfed adult females, except in *C. molestus* where both sexes were used. In this case, the absorption bands for the 2 sexes were indistinguishable.

[For extensive use as a simple practical field technique, however, infra-red spectrophotometry will probably suffer certain of the difficulties apparent in the use of radio-active isotopes for marking mosquitoes in the field, especially regarding the availability of a recording instrument in remote areas.

In this paper the use of infra-red spectrophotometry is limited to females of 3 species and males of one of these. There may be variations in males of other species. It is also possible that changes in spectra may occur in the analysis of specimens caught at various periods after feeding, particularly in freshly fed females which would be carrying a relatively large volume of undigested blood.]

J. S. Harrington

BECKEL, W. E. **Preparing Mosquito Eggs for Embryological Study.** *Mosquito News.* 1953, Dec., v. 13, No. 4, 235-7.

FOOTE, R. H. **Pictorial Keys to the Mosquitoes of Medical Importance.** IV. **Anglo-Egyptian Sudan.** *Mosquito News.* 1953, Dec., v. 13, No. 4, 255-8, 2 figs.

This simplified key is designed to assist public health workers in rapidly identifying and separating mosquitoes of primary medical importance. It deals with 4 species of *Anopheles*, *gambiae*, *funestus*, *nili* and *rufipes*. As these keys do not deal with the rest of the other 20 or so species of *Anopheles* recorded from the Sudan, they have to be used with caution. No mention is made of relative sizes, a simple character which enables small species like *funestus* and *nili* to be picked out with ease from larger species like *gambiae*, and from the even larger species like *coustani* and *pharoensis*.

Of over 100 Culicine species, the key deals with 7 species of *Aëdes*, for which the distinctive thoracic markings are well illustrated. A simplified key for larvae of these species is provided, but in practice one would probably have to refer frequently to standard works on African mosquitoes.

R. C. Muirhead-Thomson

GAUD, J. Notes biogéographiques sur les culicidés du Maroc. [Biological and Topographical Notes on Mosquitoes of Morocco] *Arch. Inst. Pasteur du Maroc.* 1953, v. 4, No. 7, 443-90, 16 figs. (1 folding). [27 refs.]

This is an interesting report on the 28 species of mosquitoes found by the author during studies in Morocco from 1947 to 1952. With numbers of breeding places as a criterion of abundance, he considers the influence of seasons, topography and other factors on changes in the frequency of many

of the listed species. Comparisons of the frequency of associations of certain anopheline larvae with culicine larvae are set out clearly. The paper is well illustrated with distribution maps, frequency diagrams, and numerous tables. The most abundant species were: *Anopheles maculipennis*, *A. claviger*, *A. turkhudi*, *A. sergenti*, *A. multicolor*, *Theobaldia longeareolata*, *Culex pipiens*, *C. theileri*, *C. hortensis*, *C. impudicus* and *Aëdes caspius*.

D. S. Bertram

RAGEAU, J. & ADAM, J. P. Note complémentaire sur les Culicinae du Cameroun. [Additional Note on the Culicines of the Cameroons] *Ann. Parasit. Humaine et Comparée*. 1953, v. 28, Nos. 5/6, 412-24, 2 figs. [14 refs.]

This report adds 18 new species of Culicines to a list published as recently as 1952 by the authors [this *Bulletin*, 1953, v. 50, 653], bringing the total so far to 83 species. This increased entomological activity is a direct result of an antimalaria campaign carried out in the Cameroons under the aegis of the WHO.

Females of *Taeniorhynchus (Mansonioides) africanus* and *T. uniformis* bite actively indoors in the evening and early hours of the night, and probably play a rôle in the transmission of *Wuchereria bancrofti*.

The possible place of Cameroons *Culex fatigans* in the *fatigans-molestus-pipiens* complex is discussed.

A new *Culex* sp. larva is described, the adult of which is not yet known.

R. C. Muirhead-Thomson

YATES, W. W. Notes on the Ecology of *Culiseta* Mosquitoes found in the Pacific Northwest. *Mosquito News*. 1953, Dec., v. 13, No. 4, 229-32.

Of the 5 species of *Culiseta* found in the Pacific Northwest, only 2, *C. inornata* and *C. incidunt* are sufficiently abundant or widely distributed to be of economic importance.

C. incidunt prefers fowls or domestic animals as hosts, but under certain conditions is annoying to man. *C. inornata* likewise will attack man but is easily discouraged.

The diverse breeding places are described; collections from a light trap over a number of years have provided information about seasonal and geographical distribution. Both species overwinter as adults.

R. C. Muirhead-Thomson

PIMENTEL, D. & KLOCK, J. W. Disinsectization of Aircraft by Residual Deposits of Insecticides. *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 191-4.

The authors state that their unpublished work has shown that procedures approved by WHO [this *Bulletin*, 1951, v. 48, 930] for aircraft disinsectization will not destroy house-flies if they are carried out during flight, and further, that higher dosages than those recommended are required to kill flies and mosquitoes in baggage compartments. They have therefore investigated the value of residual spray treatments to supplement the aerosol.

The insecticides, dissolved in methylcyclohexane, were sprayed over all permanent interior surfaces of various passenger aeroplanes. Experiments were done, both in the air and on the ground, by releasing 200 mosquitoes

(*Aëdes aegypti*) or 200 female house-flies in the treated compartments and recapturing them after 45 or 90 minutes. The house-flies were tagged with 1 inch lengths of nylon thread to aid recapture. [No information is given as to the proportions recovered, which were probably very low in the case of the mosquitoes. See TEW *et al.*, this *Bulletin*, 1951, v. 48, 589.] Satisfactory mortality was arbitrarily judged as 95 per cent. kill of recovered house-flies within 24 hours. Little or no difference in results was found between tests conducted in the air and those done on the ground. The results were as follows. In the one trial of DDT at 200 mgm. per sq. ft. the highest kill of either insect was only 75 per cent. in the first week after treatment. In one trial with dieldrin at 100 mgm. per sq. ft., a satisfactory kill of house-flies was obtained for 2-3 weeks. In several trials with lindane (99 per cent. gamma BHC) at 200 mgm. per sq. ft., satisfactory kills of flies were obtained for 5 weeks and of mosquitoes for 6 weeks. This dosage, however, produced mottling of the treated surfaces. At the lower rates of 70 to 100 mgm. per sq. ft., the satisfactory kills were maintained for 2 to 3 weeks with flies and over 3 weeks with mosquitoes. A single trial with lindane applied in a chlorinated polyphenol resin was less satisfactory than the ordinary treatment.

[The authors do not point out that these treatments would be much less effective against insecticide-resistant house-flies which are prevalent in so many countries already.]

J. R. Busvine

ZHOVTUI, I. F. [**The Number of Generations and the Duration of the Cycle of Development of *Musca domestica* L. under Conditions of Baraba (Western Siberia)**] *Dokl. Akad. Nauk SSSR* (n.s.) Moscow. 1951, v. 80, No. 3, 477-80, 2 figs. [In Russian.] [Summary taken from *Rev. Applied Entom. Ser. B.* 1953, Dec., v. 41, Pt. 12, 199-200.]

Laboratory observations on the effects of temperature and breeding medium on the life-cycle of *Musca domestica* L. under the conditions of south-western Siberia were carried out in the Province of Novosibirsk in 1946 and 1947, the larvae being reared in cow, horse or pig dung or in human faeces, in all of which they commonly develop under natural conditions. The flies are active in the open for a period of some 120 days during May-September, beginning when the average temperature of the air outdoors remains above 10°C. [50°F.].

The sums of temperature required for development were calculated on the basis that the threshold is 10°C., and are given below in day-degrees centigrade [with the approximate Fahrenheit equivalents in brackets]. They were 102.9 [185] for the preoviposition period, and averaged 106.5 [192] for the egg and larval stages together, and 108.7 [196] for the pupal stage. The figures for the egg-larval and pupal stages, however, varied according to the medium in which the larvae were reared, being 131.4 [237] and 109.4 [197] with cow dung, 109.3 [197] and 118.4 [213] with horse dung, 91.7 [165] and 102 [184] with pig dung, and 94.3 [170] and 93.2 [168] with human faeces. The differences in rate of development at the same temperature in the different media are attributed to differences in the physical and chemical properties of the latter. Successive generations were reared in the various media in 1946, when the total sum of effective temperatures was 662.7 [1,193], and 1947 when it was 803.7 [1,447]. The third generation was in the larval stage at the onset of winter in all media in 1946, but third-generation pupae were obtained from cow and horse dung, and third-generation adults from pig dung and faeces in 1947.

WOLFINSOHN, M. **The Influence of the Water Content of the Medium on the Accumulation of Larvae and Pupae of the House-Fly.** *Bull. Res. Counc. of Israel.* 1951, v. 1, Nos. 1/2, 166-8. [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, Dec., v. 41, Pt. 12, 199.]

As it had been observed that larvae of the house-fly [*Musca domestica* L.] that were being reared in a mixture of bran, straw and water in a sloping container, accumulated before pupation in the higher (and consequently drier) end, the phenomenon was examined more thoroughly. About 10 lb. of a 1:1 mixture of straw and bran was put into each of three containers and moistened with 2·66, 3·33 or 4 gals. water; 3 cc. of eggs were spread on the surface of the medium in each. The containers were 55 in. long and inclined so that one end was 2 in. higher than the other. They were kept at 28°C. [82·4°F.], and natural evaporation was allowed. After six days, the medium was removed from each container in six equal sections from the higher end to the lower end and examined for pupae. About half were in the highest section, and nearly all in the highest three. The proportion in the lower sections fell as the amount of water originally put in the container increased. Migration of the larvae to the drier medium began when they were three days old. In an experiment in which larvae could migrate from one section to another of a container in which water formed 0, 44·1, 61·2, 70·3, 76 and 80 per cent. by weight of the original composition of the medium, the remainder being straw and bran, they were found to prefer to pupate in the second section, the moisture content of which had fallen to about 26 per cent. when pupation occurred.

WELCH, Sarah F. & SCHOOF, H. F. **The Reliability of "Visual Surveys" in evaluating Fly Densities for Community Control Programs.** *Amer. J. Trop. Med. & Hyg.* 1953, Nov., v. 2, No. 6, 1131-6.

Experience has shown that the use of the Scudder grill for counting the density of flies [*Bulletin of Hygiene*, 1947, v. 22, 653] in practical schemes on fly control in American towns absorbs a good deal of time and is not accepted with unreserved approval by operators. Tests were therefore made to determine if some more rapid and acceptable method of assessing fly density would be equally reliable. A test consisted of an experienced inspector estimating, by direct observation, the number of flies he would expect to record from an attractive site if a Scudder grill were used ("estimated grill count"), followed by an "actual grill count" in which the grill was used. The comparisons extended over a year and were carried out with due regard to statistical factors. Eight teams of 2 inspectors examined 2,850 attractive sites representative of the attractants normally occurring within city blocks. There was, generally, quite close agreement between "estimated" and "actual" grill counts and some of the comparisons tabulated in the paper are given below. The figures are for average number of flies per grill:

<i>Estimated</i>	<i>Actual</i>
4·1	4·5
27·0	28·5
33·0	34·7
19·3	26·8
32·8	43·6
25·7	30·8
14·0	15·3
32·3	35·5

In practical control work, a certain Scudder grill count (which varies with season and site) is judged to be a threshold value which, if exceeded, calls for renewed application of the control measures. Apart from one person, the inspectors agreed in further tests for the need for fresh control action at assumed threshold values of 3, 6 or 11 flies per count.

It is concluded that persons experienced in estimating fly densities from use of the Scudder grill can, without loss of efficiency, discontinue using it in favour of a direct assessment. This method reduces the time for the survey of a city block by about one-third. It is not known if an untrained person could attain comparable efficiency and reliability by direct assessment. It is suggested that all inspectors should be trained first in the use of the Scudder grill so as to establish a yardstick for the more rapid assessment by direct observation. Periodic use of the grill later would help to maintain the standard of reliability.

D. S. Bertram

DEORAS, P. J. & RANADE, D. R. Studies on Muscidae. I. Collection of, and some Observations on the Muscid Flies of Poona City. *J. Univ. of Bombay*. Sect. B. Biol. Sci. 1953, Nov., v. 22, Pt. 3, 1-17, 1 graph. [12 refs.]

Collections of muscid flies were made at various points in the city of Poona, throughout a complete year. The sites chosen were: 4 dairies, 4 residential houses, 3 drain areas and 4 markets. The flies were caught by hand net while they were settling on animals, food, refuse, etc. Identifications were made in the laboratory and confirmed at the British Museum (Nat. Hist.), London.

The climate of Poona is continental in type with large diurnal ranges of temperature. The highest temperature is from March to June and the lowest in December. Humidity is rather high during the wet season (June-October) and low for the rest of the year. The total fly population is greatest in warm weather (75° to 88° F.) and there are two peaks of abundance in March and July, with recession in the hottest weather in May. [This is similar to the situation in Egypt. See MADWAR and ZAHAR, this *Bulletin*, 1953, v. 50, 1090.] As regards the different sites collected, flies were most abundant in dairies, followed by markets, houses and drain areas (124, 82, 19 and 14 per month, respectively). The most common species was *Musca domestica nebulo* (48 per cent.) followed by *M. d. vicina* (28 per cent.), *M. sorbens* (12 per cent.), *M. pattoni* (8 per cent.) and small numbers of other species. *M. d. nebulo* and *M. d. vicina* were in all sites roughly in the ratio 3 to 2; but the prevalence of *M. sorbens* was greater in outdoor places (lowest in houses, highest in drains). [The abstracter observed the same phenomenon in Lagos, Nigeria.] In all habitats, except inside dwelling-houses, females were more numerous than males.

J. R. Busvine

REID, J. A. Notes on House-Flies and Blow-Flies in Malaya. *Bull. Inst. Med. Res. Fed. Malaya*. 1953, n.s. No. 7, 1-26, 6 figs. [35 refs.]

This is a useful account of the blowflies and house-flies of Malaya in which the author's own observations and experience emphasize the problems which arise in fly control in Malayan conditions. In highland areas the house-fly, *Musca vicina*, breeds in bean cake and brown dust used as a manure in large vegetable gardens, as well as in a variety of domestic collections of refuse, fowl and goat droppings. Liquid pig manure and pit latrines breed *Chrysomyia megacephala*. In lowland districts (Kuala Lumpur) domestic refuse was rather more important as a breeding place

than manured vegetable gardens. Inefficient night-soil trenching encourages breeding of house-fly, blowfly and fleshfly. Note is made of the apparently greater populations of house-fly in the highlands than in the lowlands. It is suggested that this is partly due to concentration of flies to relatively fewer people in the less well-populated highlands and partly to the scarcity of scavenging ants (which destroy larvae) in the highlands.

As regards control, emphasis is clearly directed to good hygienic disposal of wastes rather than the use of insecticides. The measures applicable to the different types of breeding places in Malaya are discussed in some detail. The recognition, biology and significance of *M. vicina* and *C. megacephala* in particular, and also *C. bezziana*, *Lucilia cuprina*, *Sarcophaga*, *Stomoxys*, *Lyperosia* and a few other flies are discussed and illustrated with well selected drawings from acknowledged sources.

D. S. Bertram

ASCHER, K. R. S. & LEVINSON, Z. H. **Chemicals affecting the Preimaginal Stages of the Housefly. I. A Review of the Literature.** *Riv. di Parassit.* Rome. 1953, Oct., v. 14, No. 4, 235-59. [Numerous refs.]

Though it does not claim to be exhaustive, this review mentions practically all the more important contributions to the subject in recent years. The 3 pre-imaginal stages—egg, larva and pupa—are considered separately, and under each heading the chemicals are grouped as plant-products or synthetic compounds, with separate mention of the chlorinated hydrocarbons. Unfortunately the review is rather uncritical; for example, both DDT and gamma BHC are quoted as being non-larvical and elsewhere as causing various mortalities, by different authors. Also, there is perhaps not enough sharp distinction between the results of laboratory experiments and field trials. However, the paper is useful in providing a guide to the difficulties of controlling house-fly larvae, especially with the development of insecticide resistance (which is also outlined in so far as it affects larvicides).

J. R. Busvine

TAHORI, A. S. & HOSKINS, W. M. **The Absorption, Distribution and Metabolism of DDT in DDT-Resistant Houseflies.** *J. Econom. Entom.* 1953, Apr. & Oct., v. 46, Nos. 2 & 5, 302-6; 829-37, 2 figs. [15 refs.]

The penetration of DDT and its metabolism in different parts of the body of the house-fly has been studied in 4 resistant strains. DDT, applied to the backs of flies in acetone solution, was subsequently recovered by chloroform washing (from the outside) or by grinding and extraction (from inside the flies). DDT and DDE were measured by the Schechter-Haller method. Penetration is rapid in the first 4 hours and somewhat slower afterwards. Death reduces the entry of DDT, but does not stop it. There is some evidence that penetration in one strain was slightly slower than in others.

In the body, the DDT is metabolized to DDE and to unknown metabolites, referred to as "X". In flies that are killed, the amount of DDT inside the body steadily increases; but, in survivors, the internal DDT reaches a maximum in about 4-8 hours after application and then slowly declines. The amount of DDE increases up to 2 days and then declines, while the amount of X increases throughout. The same things happen with repeated applications of DDT, except that the quantity of DDE does not fall off.

Larvae reared on DDT-containing medium contain much unchanged DDT

(more than can be tolerated by adults) and very much DDE. Many flies from these larvae cannot emerge and others show DDT convulsions for a time after emergence. Both the contained DDT and the DDE gradually disappear.

These findings are explained by the theory that DDT is changed to DDE, which is then converted to X. This is supported by the fact that DDE itself is absorbed and metabolized at about the same speed as DDT. Also, as might be expected, the presence of excess DDE slows down the metabolism of DDT and thus acts as a synergist. (Since there is more unconverted DDT, a higher kill results.) The only fact difficult to reconcile with this hypothesis is that in the early stages after application of DDT, the amount of X increases more rapidly than the amount of DDE. [It should also be mentioned that other workers do not get the same results. Thus: STERNBURG and KEARNS, *Ann. Ent. Soc. Amer.*, 1950, v. 43, 444, and Sternburg *et al.*, this *Bulletin*, 1953, v. 50, 1173, find that DDE is not metabolized. Also MARCH *et al.*, *ibid.*, 1953, v. 50, 463, find that DDE is only slightly synergic to DDT.]

In efforts to locate the site of degradation of DDT, applications and extractions were made with different parts of the flies' bodies. Penetration into the head or thorax was more rapid than into the abdomen. Within 24 hours of application to the head, thorax or abdomen, the DDT had spread to the other regions of the body. Most was still in the region treated, but there was a general shift towards the abdomen where the amount of DDE found was always highest.

Extractions of internal organs were compared with extractions of the cuticle after applications of DDT. It was found that the ratio of DDE/DDT was always higher in the external parts, confirming the findings of Sternberg and Kearns (1950) (*loc. cit.*), who suggested the cuticle as the main site of DDT degradation.

The authors agree with other workers that elimination of DDT does not explain all aspects of DDT resistance. For example, the effect of increased temperature is well known to decrease the insecticidal action of DDT and this is true with resistant house-flies. But the higher temperature increases rate of penetration much more than the speed of metabolism of DDT; and the resistance to DDT due to high temperature, like insecticide-resistance generally, seems to be some unknown ability of the insects to store DDT harmlessly in the body.

J. R. Busvine

GOODWIN-BAILEY, K. F. & DAVIES, M. **Occurrence of Dieldrin-Resistance in Wild *Musca domestica* L. in England.** [Correspondence.] *Nature*. 1954, Jan. 30, v. 173, 216-17.

The flies investigated were taken from a refuse tip in Hertfordshire, where DDT and gamma BHC had been in use for the previous 4 years. It was believed that the flies had developed resistance to these 2 insecticides and in the summer of 1953 dieldrin was tried without much success. A laboratory colony of the resistant flies was maintained alongside normal flies. Both strains were subjected to tests with oil sprays to determine their average resistance to DDT, gamma BHC and dieldrin. The results indicated that the wild strain was 19 times as resistant to DDT, 53 times as resistant to gamma BHC and 266 times as resistant to dieldrin as the normal colony. A simple test showed no difference in resistance to pyrethrins.

[Three years ago the abstracter showed that resistance to dieldrin had developed in Sardinian flies, exposed only to DDT and chlordane (this

Bulletin, 1952, v. 49, 89). The chief interest of the present paper is the very high level to which such resistance may develop.] *J. R. Busvine*

FAIRCHILD, G. B. **Arboreal Tabanidae in Panama (Diptera).** Reprinted from *Proc. Entom. Soc. of Washington*. 1953, Oct., v. 55, No. 5, 239-43.

In Panama, as in Africa, collection of mosquitoes in forest at various times of day and at different levels above the ground has incidentally produced information about other biting insects. The author shows that no less than 54 species of Tabanidae have been captured in this way in a Central American forest; some of the species occur only in the treetops, others only at ground level. The arboreal species belong to several genera which are not closely related to one another; in this respect there is a contrast with Africa in which it appears that the arboreal Tabanidae belong to the genus *Chrysops*. The author comments on the large number of strictly arboreal mammals existing in forests in the tropics of the New World. Apart from Primates of several genera, there are sloths, ant-eaters, several marsupial opossums, an arboreal porcupine and so forth.

P. A. Buxton

NOLAND, J. L. **Sterol Metabolism in Insects. I. Utilization of Cholesterol Derivatives by the Cockroach *Blattella germanica* L.** *Arch. Biochemistry*. 1954, Feb., v. 48, No. 2, 370-79, 1 fig. [37 refs.]

SCHÄDLINGSBEKÄMPF. 1953, Oct.-Nov., v. 45, Nos. 10/11, 149-59. Mittel zur Bekämpfung Tierischer Gesundheitsschädlinge. [**Preventive Agents Against Animal and Insect Carriers of Disease**]

This is a catalogue of proprietary preparations of insecticides and rodenticides available in Germany and of the addresses for sources of supply.

D. S. Bertram

RICHARD, C. Application de la méthode Alessandrini modifiée par Lanzing à l'évaluation de très faibles quantités de DDT. [**Application of Lanzing's Modification of the Alessandrini Method for Estimating Very Small Quantities of DDT**] *Bull. World Health Organization*. Geneva. 1953, v. 9, No. 6, 813-20.

The method of Maria Alessandrini for estimating very small quantities of DDT [this *Bulletin*, 1950, v. 47, 1233] has been widely used for testing residual deposits of the insecticide, especially in scrapings from walls of sprayed houses. The method involves the use of strong sulphuric acid (specific gravity 1.84) and strong nitric acid (sp. gr. 1.52). The present author points out that, while the former is a common laboratory reagent, it is not always easy to obtain the nitric acid in required strength. Experience has shown that acid with sp. gr. even as high as 1.49 has given unreliable results. He therefore proposes a modification of the method developed by J. C. LANZING in which potassium nitrate is used instead of nitric acid. To compensate for the less vigorous nitration, the mixture is boiled for 5 minutes instead of 2 minutes. (Boiling for more than 5 minutes produces yellow coloration from nitration of organic materials other than DDT.) Comparative tests have shown the modified method to be less sensitive than the original; but the use of potassium nitrate is simpler and less dangerous and within the reach of all laboratory and field workers.

J. R. Busvine

REPORTS AND SURVEYS

COLONIAL OFFICE. Colonial Research 1952-1953. Colonial Medical Research Committee. Eighth Annual Report (1952-1953) [HIMSWORTH, H. P., Chairman] (pp. 103-56). Cmd. 8971. 268 pp. 1953, Oct. London: H.M. Stationery Office. [7s. 6d.]

The Eighth Annual Report of this Committee contains an account of its work, and of the regional organization of medical research in Colonial territories, a review of work in progress, and an account of research work undertaken and financed by the medical departments of Colonial territories. It is therefore very comprehensive. The regional organizations include the East African Bureau of Research in Medicine and Hygiene and the East African Standing Advisory Committee for Medical Research, the latter quite recently instituted.

The work in progress covers a wide range of subjects and, geographically, a wide area. The East African Medical Survey is assessing the prevalent diseases of part of Kenya, and the incidence of schistosomiasis in Sukumaland, Tanganyika, which is very high in schoolchildren, but does not seem to affect mental alertness. In the Cameroons an investigation of transmission of *Loa loa* continues, and surveys have shown that both *L. loa* and *Dipetalonema perstans* reach an equilibrium of high incidence and intensity in small villages in the rain forest. Filariasis due to *Wuchereria bancrofti*, and its transmission, are being investigated in East Africa and Malaya. The intermediate hosts of *Dracunculus medinensis* are being studied in Nigeria.

Malaria, of course, occupies much attention. In North Borneo the importance of *Anopheles balabacensis* (formerly known as *A. leucosphyrus*) has been established, and the possibility of control by interference with its breeding places has been confirmed in the field. In East Africa studies have been made on the resting places of *A. gambiae* and *A. funestus*, on the duration of the gonotrophic cycle, on blood meals and ovarian development, and on the ecology of anopheline larvae. In Trinidad an extensive study has been made on *A. aquasalis*. The human reservoir of malaria parasites has been the subject of investigation in the Gold Coast, where parasite rates up to 100 per cent. are found in children aged 2-4 years, though the people are well nourished and show "no obvious ill effects from their heavy parasite load". Infectivity to mosquitoes varies, and persons in whom gametocyte counts are very low are often found infective; "blood examination alone cannot give a reliable indication of the status of the individual as a source of infection".

In Nigeria the Ilaro experimental malaria control scheme produced interesting results. The average number of malaria cases diagnosed fell from 6.2 per cent. of the total attendance at the dispensary in 1949 to 0.8 in 1951. The crude birth rate rose from 34.8 per 1,000 in 1949 to 36.2 in 1952 after passing a peak of 42.5 in 1951. The crude death rate fell from 15.6 in 1949 to 12.3 in 1952. The infant mortality rate fell from 137 in 1949 to 66.7 in 1952. In this residual spray campaign the density of *A. gambiae* decreased considerably in the first year, but showed a rising tendency later; *A. funestus* was eliminated. The average cost of the Ilaro scheme in the period 1950-52 was 4s. 9d. *per caput* per annum. A larger scheme is planned for western Sokoto.

Malaria investigations in Malaya have included control in rural areas, and tests of various drugs, of which pyrimethamine has proved rather disappointing. Of the residual insecticides dieldrin gives promise of usefulness in some respects greater than that of the others.

Virus diseases have been studied at the West African Virus Research Institute, Lagos, and the East African Virus Research Institute, Entebbe; in each of these work on yellow fever has been prominent. In Nigeria epidemics of yellow fever occurred and the campaign of immunization (with the French neurotropic vaccine) which was indicated as a result of the more extensive epidemic led to the finding of "concrete evidence . . . that this vaccine is not as safe as previously described".

In Malaya work has been done on animal-borne diseases and the trombiculid mites; Japanese B encephalitis has been recognized, and neutralizing antibodies have been found in a very large proportion of pigs, bovines and equines, as well as man.

Relapsing fever investigations have continued in East Africa, where precipitin tests to determine the source of blood ingested by ticks have been made on a large scale; similar investigations have been made on biting flies and mosquitoes. A completely new technique for identification of blood meals has also been investigated.

Studies of metabolism in Africa include investigations of serum proteins, nitrogen balance and water content, oedema in liver disease and kwasiorkor. These were carried out in East and West Africa. The Hot Climate Physiology Research Unit in Nigeria has continued investigations on African subjects.

In leprosy work the emphasis has been on treatment with sulphones, thiosemicarbazone and isoniazid, and on BCG, which promises some protection against leprosy.

Nutrition work has included an investigation of goitre in Nigeria and its relation to iodine, and the continued work of the Field Research Station at Fajara, Gambia, which has led to estimations of the amino-acids of African foods, and to the relationship between nutritional state and malaria. Conferences on nutrition were held under the auspices of CCTA, FAO and WHO, full accounts of which will be published. The work of this unit has extended to investigations on malaria control, filariasis and schistosomiasis.

This most valuable account of research ends with a short section on work undertaken and financed by medical departments of colonial territories, under the headings of the countries concerned—Malaya, Kenya, Fiji, Jamaica and Tanganyika.

The whole report is readable and informative. It has the great advantage that it is not merely a list of people and subjects, but contains enough explanatory matter, and enough statement of problems and results of investigations, to be a most useful summary of current work, especially for medical administrators and others who wish to be informed on subjects outside their own immediate fields.

Charles Wilcocks

CONGO BELGE. Fonds Reine Elisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge. Rapport sur l'Activité durant l'année 1951. [Report of the Activities of FOREAMI during 1951] [DRICOT, C., Médecin-Directeur du Fonds en Afrique]. 129 pp., 24 figs. on 12 pls., 7 diagrams, 3 charts & 4 maps (2 folding). [1953.] Brussels: 39, Rue du Commerce.

FOREAMI is continuing its experimental programme of the development of curative and preventive medical services in rural areas in the Belgian Congo, reports of which have been previously reviewed [this *Bulletin*, 1952, v. 49, 913; and 1951, v. 48, 595]. The census-taking on which the experimental work is based is now reduced in quantity and first emphasis

is placed on the provision of hospital facilities and the practice of preventive medicine. The report is illustrated by numerous statistical tables and by brief statements concerning each of the major causes of illness. Trypanosomiasis continues to decrease; the number of new cases found in an annual examination of practically the entire population having fallen from 0·31 per cent. in 1938 to 0·08 per cent. in 1951. When previously known and new cases are considered the present incidence is 0·3 per cent. Strong emphasis is placed on the use of pentamidine prophylaxis in prevention, and direct control of the tsetse fly is carried out on a small scale only, as in a scheme for the air distribution of DDT over the forest in the neighbourhood of Leopoldville.

Malaria constitutes 3·35 per cent. of all treated sickness; experiments have been carried out in chloroquine prophylaxis in infants 0·01 gm. per kgm. being given in solution once each week. Where well supervised it was found to cause a reduction of the parasite rate in one year from 62·5 per cent. to 2·2 per cent.; where less well supervised it caused a reduction from 61·6 per cent. to 11·6 per cent., while in control areas there was a slight increase.

The incidence of treated yaws remains unchanged at 0·11 per cent. of the population. The incidence of leprosy amounts to 0·3 per cent. of the population; trial has been made with the new drugs, particularly DDS given in some cases in daily doses though experiments have been tried with the suspension of DDS in ethyl chaulmoograte with promising results. The mass miniature radiography scheme is reported on for the first time, the number examined was 104,073, of whom 473 (4·5 per 1,000) were found to be suffering from pulmonary tuberculosis. A repeat examination in one area after the lapse of a year showed that the incidence of fresh infection per annum amounted to 0·82 per 1,000. Notes are also given on the following diseases: venereal diseases, dysentery, helminthiasis, phagedaenic ulcers, filariasis, alimentary disturbances and surgical complaints.

The report concludes with a series of original papers. HIMPE and PIERQUIN describe the use of chloroquine as a prophylactic against malaria for infants [see also this *Bulletin*, 1951, v. 48, 125]. The same authors with MATTINGLY and BASILEWSKY describe a study of the mosquitoes of an area in the Kwango. They list the species found together with the details of place of origin. BROU describes the use of a new ascaricide called Nematolyte of which preliminary trials appear promising. VELGE gives a detailed analysis of the first year's mass miniature radiography programme which should be consulted by those interested in tuberculosis in Africa.

G. Macdonald

CECCALDI, J. The Pasteur Institute of Brazzaville (French Equatorial Africa). Reprinted from *Rev. Méd. Sci. de l'Afrique Noire et de l'Union Française*. 1953, No. 3, 13 mimeographed pp., 13 graphs (2 folding).

In this paper Dr. Ceccaldi, who is Director of the Pasteur Institute of Brazzaville, gives a short but informative account of the history and development of that Institute which is now not far from its half century.

In 1906 the French Geographical Society organized a mission for the study of sleeping sickness in the French Congo. On the proposal of Dr. ROUX, who was then Director of the Pasteur Institute in Paris, Drs. Gustave MARTIN, Le BOEUF, and ROUBAUD were chosen to take part in this mission and they arrived in Brazzaville at the end of the year with the necessary

funds, equipment and experimental animals. The scientific plans were drafted by Drs. BOUVIER, GIRARD and LAVERAN, and the members of the Mission set up a one-storey building and animal house in Brazzaville; these buildings were still standing in the grounds of the present Institute as recently as 10 years ago.

After 2 years of productive pioneering work on the biology, epidemiology and treatment of trypanosomiasis it became evident that this important work must be continued. The Geographical Society accordingly gave all the equipment and remaining funds of the Mission to the Pasteur Institute, while the Government of the French Congo presented the land and existing buildings in Brazzaville and an agreed annual contribution for maintenance. The French Equatorial Branch of the Pasteur Institute was thus formally created by a convention signed in October 1908, and in 1909 Dr. MARTIN, head of the original Mission, became its first Director.

In the new Institute, research work in the French Congo was carried out under the guidance of the Paris Pasteur Institute; the central direction was undertaken in Paris by Professor MESNIL, who was succeeded in 1937 by Professor Pasteur VALLERY RADOT, then by Dr. Noël BERNARD and it is now in the hands of Dr. VAUCEL, Inspector-General of the Overseas Pasteur Institute.

In the early years, work was devoted almost entirely to the study of trypanosomiasis, with important results which are well known: but general microbiology was not ignored; studies were made into the enteric diseases, pneumococcal infections, rabies and tuberculosis, and soon the spreading field of investigational work outgrew existing accommodation. Accordingly in 1932 a new building was erected and the work was extended in many directions. The Institute also became a clinical and public health laboratory for Brazzaville, and when the importance of animal diseases in the tropics became apparent a veterinary annex was opened in 1937.

There is an inspiring account of the activities of the Institute between 1940 and the liberation of France in 1945, when it carried on its functions, and much of those of the parent Institute, on Free French territory under very difficult conditions. Since relations with metropolitan France were cut off, the Brazzaville Institute took on the provision of vast quantities of vaccines and sera for French forces in many theatres of war, including serum for transfusion for the benefit of forces in the Far East.

In the meantime, a building started in 1939 was completed and devoted to the trypanosomiasis service, and other extensions were made. Work was widely extended to embrace a large variety of subjects and another very large building was started in 1945. Finally in 1952 a biochemical laboratory was built, with modern equipment and air-conditioned quarters for the study of physics, physiology and in particular the physiological standards of Africans.

There is a brief review of the work of the Institute, relating especially to trypanosomiasis and its chemotherapy, rabies, yellow fever, rickettsial diseases, and the well-known studies on encephalomyelitis virus. Three charts indicate respectively the increased production of smallpox vaccine, the increase in laboratory examinations and in the output of rabies vaccine throughout the years: the vast increases in the last 10 years are striking, and the figures for 1952 are, respectively, nearly 2 million doses of vaccine, 26,452 laboratory examinations, and from 181,700 to 120,800 cc. of rabies vaccine in 1951 and 1952.

Evidently these efforts could not be limited to the Brazzaville Institute only. Over 40 years ago the prospect of a branch in the Northern part of the Federation was conceived, and as a result of recent discussions the new

Pasteur Institute of Bangui will be realized with the shortest possible delay, as a first step in the creation of more laboratories within the Federation.

The author pays a generous tribute by name to the many eminent persons who have contributed to and inspired the work of the Institute: modestly, he makes no reference at all to his own contribution to its success and to tropical medicine in general, particularly in the field of the chemotherapy and control of sleeping sickness; but readers of this *Bulletin* will need no reminder of how considerable and distinguished Dr. Ceccaldi's own contribution has been.

H. J. O'D. Burke-Gaffney

- i. COONOR. **The Pasteur Institute of Southern India, Coonoor. Annual Report of the Director 1952** [VEERARAGHAVAN, N.]. 28 pp., 2 charts. 1953. Madras: Diocesan Press.
- ii. COONOR. **The Pasteur Institute of Southern India, Coonoor. Scientific Report 1953** [VEERARAGHAVAN, N., Director]. 29 pp., 1 folding graph. 1953. Madras: Diocesan Press.

i. A notable occasion for the Institute in 1952 was the holding there of an International Conference and Seminar on Rabies, sponsored by WHO. The Conference was attended by 11 discussion leaders, 38 Fellows from 21 countries and 7 other observers.

The report gives the usual full account of anti-rabic treatment, with full statistical tables. Among the 317 persons receiving complete or incomplete treatment at the Institute there were no deaths. Among the 21,293 treated at subsidiary centres, there were 28 deaths, a mortality rate of 0·13 per cent. Treatment was also given to 2,333 animals of which about half were dogs.

The number of routine laboratory examinations made was 6,179. At the blood bank, 8,050 cc. of plasma were prepared.

ii. The scientific report is now issued as a separate publication. It contains a number of papers of interest which might suitably be published in medical journals.

The Director of the Institute, Dr. VEERARAGHAVAN, analyses the results of anti-rabic treatment at the Institute from 1907 to 1952, during which period 437,213 persons were treated. It is shown in tables that among the different vaccines used during those 46 years the best results were obtained from the use of 5 per cent. Semple's (sheep brain) vaccine, which has been in sole use since 1933. On the other hand, the incidence of neuro-paralytic accidents was sharply limited to this period, though fortunately the rate of incidence, 1 in 21,463, was very low and compares favourably with that reported elsewhere.

The Director also presents a detailed study of mortality among treated and untreated persons in relation to the value of 5 per cent. Semple vaccine. This paper is being abstracted separately in this *Bulletin*.

In a paper with BALASUBRAMANIAN, the Director describes a study of the action of ACTH in rabies. It appeared to have no value in animals challenged intracerebrally, but seemed to be of some value in those challenged intraperitoneally. There was a marked depression of eosinophiles at the time of onset of rabies and the eosinophiles usually disappeared at the time of death. It is suggested that normally there may be a stimulation of the adrenal cortex in rabies.

The same two workers studied the action of insulin in rabbits subsequently challenged with rabies virus, in an attempt to find the cause of the marked hypoglycaemia known to occur in animals with that disease.

Although all the control rabbits died of rabies, one-third of those previously treated with insulin survived. The number of animals used was, however, small and this remarkable observation has to be confirmed on a larger group.

The Director, with SUKUMARAN, studied the prevalence of Q fever in the Nilgiris and Coimbatore districts, by means of the complement-fixation test. Of 385 sera tested, which included 99 human and 149 cattle sera, there were 32 positive in the screening test (1 in 16 dilution); these were 7 human, 19 cow, 4 bullock and 2 sheep sera. Only 7 specimens were positive at 1 in 32 and 2 at 1 in 64.

KURIAN studied 49 strains of *C. diphtheriae* isolated from patients in the Nilgiris. A table covering 6 years shows that three-quarters of the cases occur between May and September. Only one strain was shown to be non-virulent and only one of the virulent strains conformed with the description of the *gravis* type.

MENON and his colleagues present a very detailed epidemiological and laboratory study of influenza, as a result of their work at the Government of India Influenza Centre at the Institute. These studies are being abstracted separately in the *Bulletin of Hygiene*.

[These reports are extremely interesting and informative. The separate publication of the scientific section is of value, but that value would perhaps be even greater if these papers were published more frequently in the general medical literature having a wider circulation. For the 1951-52 Report, see this *Bulletin*, 1953, v. 50, 661.] H. J. O'D. Burke-Gaffney

HOFFMANN, R. Fortschritte in der Tropenhygiene und der Bekämpfung tropischer Seuchen. [Advances in Tropical Hygiene and Prevention of Tropical Diseases] *Öffentl. Gesundheitsdienst*. Stuttgart. 1954, Feb., v. 15, No. 11, 409-16.

A general review.

BOOK REVIEWS

WAKELEY, Cecil [K.B.E., C.B., LL.D., M.Ch., D.Sc., F.R.S.E., F.R.A.C.S., F.A.C.S., F.R.S.A., F.Z.S.]. [Edited by.] **The Faber Medical Dictionary.** pp. vii + 471, 6 figs. 1953. London: Faber & Faber Ltd., 24, Russell Square, W.C.1. [45s.]

[This review appears also in the *Bulletin of Hygiene*, 1954, v. 29, 540.]

Comparison of this dictionary with the American Illustrated Medical Dictionary by DORLAND will be inevitable but unfair, since the objects of the two are dissimilar. Whereas the latter is encyclopaedic, the former is an attempt to give a concise explanation of medical and surgical terms used not only by doctors, nurses and dental surgeons, but also by the very large number of other, less specialized, workers in the Health Service in Great Britain. It succeeds admirably in its aims, as is only to be expected with such a distinguished editor and team of helpers. Mistakes and omissions are inevitable in a book of this sort, but they are much less frequent than might be expected from its size. It provides brief, accurate definitions, derivations, pronunciation, short biographical notes where necessary and useful cross references. It is, moreover, up to date. John Rathborn

DUMAS, J. Les animaux de laboratoire. Anatomie, particularités physiologiques, hématologie, maladies naturelles, expérimentation. [Laboratory Animals. Their Anatomy, Physiology, Haematology, Natural Diseases and Experimental Methods Concerning Them] 719 pp., 163 figs. 1953. Paris: Éditions Médicales Flammarion, 22, rue de Vaugirard, 6e. [3,725 frs.]

The number of species of animals used by laboratory workers today is large and those in common use include guineapigs, rabbits, mice, rats, cotton rats, hamsters, ferrets, ground squirrels, pigeons, fowls, monkeys, cats and dogs. The maintenance of healthy animals for use as laboratory reagents is essential for many research stations and the aim of this book is to provide a guide and reference volume. The anatomy, physiology and care of dogs and cats are already well described in different text-books provided for students of veterinary medicine; in this volume one finds brief accounts of the anatomy, physiology, breeding, care of, and maintenance of health of, the other species of animals enumerated above.

The first part consists of 8 chapters and gives brief and general descriptions of each animal species; anatomical features are described under the different systems and are illustrated with good line drawings. The dental formulae, the average size and weight of the specific organs, the normal blood picture, the periods of gestation, and instructions as to care and breeding are given briefly and succinctly. Each chapter is concluded with a bibliography.

The three chapters of the second part are concerned with the structure and types of animal houses and cages. Emphasis is given to the necessity for the cleansing of animal habitations and the structure and equipment in isolation units are considered. There is a number of formulae of the foods supplied to the different animal species in order to satisfy their specific nutritional requirements.

The third part is the largest of the four and deals with the diseases which may occur naturally in the animals considered. There are descriptions of the bacterial, virus and protozoal infections; consideration is given to those neoplasms which arise spontaneously as well as to the parasitic worms, the ectoparasites and to the disturbances of health associated with faulty nutrition.

The fourth part is given up to a description of the current methods employed in the utilization of animals for experimental purposes. Particulars are given of the ways in which animals are controlled during experimental procedure, their anaesthesia, the ways in which they may be inoculated and the care taken in autopsy and disposal of carcasses. The last pages of the book contain an alphabetical index and tables of contents.

In many ways it is a remarkable book because it is so comprehensive and its value to the bacteriologist and pathologist is assured. It should be, in fact, a useful guide to all who use laboratory animals for experimental purposes and those who study the diseases of poultry and rabbits will also find some useful information in it. It is necessary that experimental pathologists and physiologists and those who use laboratory animals are aware of the multitude of infections and disorders which may arise in laboratory stock, for if this is not appreciated, then false deductions are made and wrong conclusions reached. It is refreshing to find that the author includes accounts of the neoplasms which are found in these animals—an aspect frequently neglected.

Many minor faults are to be found but they are small and of little importance. If the author realized the speed with which guineapigs "come

into season" after parturition then he would not suggest the removal of pregnant guineapigs to separate cages; appreciation of the time of oestrus means that more litters are produced each year. The nomenclature of some of the infective agents is confusing and bacteriologists will not like the names given to some bacteria in the genus *Corynebacterium*. Many authors who are given places in the bibliography would find some amusement at the spelling of their names, especially if the name begins with Mac or Mc. This may be a little excusable but the initials should not vary as frequently nor should the abbreviations of the journals lead to confusion. It is sometimes difficult to determine the actual journal to which a reference is made. The section on anaesthesia could be revised and more mention made of the excellent results obtainable with nembutal and allied drugs. The brief reference to barbiturates with discussions on the uses of chloral and urethane is not as satisfying as some other sections. These are, in general, faults which can be rectified in further editions; this one is recommended and will be appreciated by those who realize the importance of healthy, uniform stock for experimental purposes.

R. Lovell

ROBERTS, Austin [D.Sc., C.M.Z.S.]. **The Mammals of South Africa** [Edited by R. BIGALKE & others], with a foreword by J. STEVENSON-HAMILTON. pp. xlviii + 701, frontispiece, 77 pls. (23 coloured), 1 map & 1 diagram. 1951. Johannesburg: The Trustees of the Mammals of South Africa Book Fund. [75s.]

This book is intended to meet the interests of both the professional scientist and the layman and it appears to have achieved this dual purpose with very considerable success. It deals with about 1,000 mammals (including subspecies) in South Africa south of a transverse line from the Zambezi River in the east to the Cunene River on the west coast; as a rule, only very general reference is made to the distribution of species beyond this line. The arrangement of the subject-matter follows a scientific, systematic classification by orders, families, subfamilies, genera, species and subspecies with, in certain groups, intermediate divisions of suitable designation. The scheme of classification is set out fully at the beginning of the book and the text follows in the same sequence, quick reference to any animal or grouping being possible from the page numbers given in the tabulated scheme of classification. At the end of the book there is an index to scientific names, including all synonyms, in which the names accepted by the author are shown in heavy type. A separate index is provided for common names in English and Afrikaans; the bibliography comprises a list of the works of about 340 authors.

According to the complexity of a group, keys are provided to families, subfamilies, genera, species and subspecies, and the characters used are chiefly those to be seen without resort to skeletal details and measurements. Similar treatment is given to the descriptions in the text, but 138 tables collected together as appendices provide a wealth of numerical data on external and on cranial dimensions for those who need or wish such information.

The text descriptions of the animals are preceded by the full scientific names in trinominal form, followed by the common names in English and in Afrikaans and, in many cases, by the several names by which they are known to various tribes. Full synonymy is also given, except for *Rattus rattus* which is omitted as too complex for inclusion in this book. Interesting accounts are given of the habits of the animals as well as of their distribution within South Africa.

The illustrations consist of one line-drawing map of South Africa (showing political territories and place names, and indicating the chief zoo-geographical regions and river systems), 54 plates of photographs of skulls (each plate giving the lateral, dorsal and ventral aspects of the skulls of about four animals) and 23 colour plates. Each colour plate gives a small but attractive and distinctive colour drawing, by the Rev. P. SMIT, of about 10 different animals. The numbers of animals of different groups represented in colour are roughly as follows: primates (21); shrews and moles (20); bats (21); civets, genets, mongoose (20); larger carnivores (20); antelope, buck, etc. (40); rodents (70); zebra (3); dassies (4); besides giraffe, pig, hippopotamus, rhinoceros, elephant, otter, badger and sea lion. In all, 228 animals are illustrated in colour. Bone structure of the mammalian skull is shown in annotated drawings of the jackal skull.

The systematic part of the work is preceded by about 20 pages devoted to various aspects of the study of animals, including a discussion of the author's views on the status of genera, species and subspecies, the history of mammalogy in South Africa, the economic relationship of mammals to man (including very general brief statements about their significance in the medical field), and the importance of plans for game preservation either under private or government auspices. The most extensive part of this introduction, however, describes the principal features of 26 subregions or zoo-geographical areas within South Africa; the extent of ranges of habitat is remarkably wide. The usual animals of these areas are indicated and there is some discussion of interesting features about their distribution limits and how these may have been determined by climatic changes and deviations of river systems in the past, and so on.

The author died shortly before the publication of his work which was, fortunately, completed by a committee representative of scientific colleagues and about 300 subscribers. It is a big volume, about $11'' \times 9'' \times 1\frac{3}{4}''$, and rather heavy (nearly 6 lb.) for the field. It is clearly printed on excellent paper, and strongly bound. A few printing errors were noticed: "hight" for "height" on page 288 and "l" omitted in "locality" in Table 138. At a price of £3 15s. it contains a remarkable wealth of information and illustration.

D. S. Bertram

ALPHABETICAL LIST OF AUTHORS OR SOURCES

- Aikawa, J. K. & Harrell, G. T., 563 bis
 Aleixo, J., 637
 Allison, A. C., 526
 de Almeida, M. A., 560
 613
 Alves, W. D., Gelfand, M. & Weinberg, R.,
 Anderson, H. H. & Chang, Y. T., 588
 Ansari, N. & Faghili, M., 557
 Arakawa, S., Kitamura, O., Mitsui, Y. &
 Tanaka, C., 640
 Arnold, H. L., Jr., 593
 Artigas J., J., 582
 Ascher, K. R. S. & Levinson, Z. H., 653
- Bacigalupo, J., (617)
 Badenoch, J. & Callender, Sheila T., 627
 Baltazard, M. & Ghodssi, M., 576
 Banerji, B., 628
 Barbosa, F. S., Dobbins, J. E., Jr. & Coelho,
 M. V., 605
 Barnes, W. L. G., 542
 Barreto, A. M. (607)
 Bearup, A. J., Lawrence, J. J. & Heydon,
 G. A. M., 645
 Beckel, W. E., (648)
 Bettinotti, C. M., 549
 Biagi F., F., 558
 Bietti, G. B. & Ferraris de Gaspare, P.
 F., 641
 Bigalke, R., 663
 Bol. Oficina Sanitaria Panamericana, (627)
 Bond, H. W. & Nolan, M. O., 609
 Brand, P. W., 599
 Bringmann, G. & Holz, J., 636
 British Med. J., 526, 534, 538
 Brown, H. W., Chan, K. F. & Ferrell, B.
 D., 625
 Bruce-Chwatt, L. J., 534
 Brück, E. & Brandis, H., 580
 Burrows, R. B., 646
- Cairo : Ministry of Public Health, 603
 Cannon, D. A. & Dewhurst, F., 567
 Cantrell, W., 548
 Capocaccia, L. & Mastrandrea, G., 624
 Carley, J. G. & Pope, J. H., 564
 Carneiro, V., (577)
 Ceccaldi, J., 658
 Chams, (641)
 Chandler, A. C., 642, 643
 Chardome, M., Peel, E. & Lambrecht, F.
 L., 525, 526
 Charles, L. J. & Semevet, G., 529
 Chatgidakis, C. B., 585
 Chatterjee, J. B. & Das Gupta, C. R.,
 629, 630
 Chernin, E., 644
 Chu, T. S., 555
 Cicchini, T. & Corporandi, G., 556
 Colas-Belcour, J. & Vervent, G., 556
 Colonial Office, 542, 656
 Congo Belge, 657
 Coonoor, 660 bis
 Cooper, C. D. & Wacker, W. E. C., (631)
 Cornibert, 595
 Cossermelli, W. & da Silva, R. P., 597
 da Costa, O. R., 604
 Courter, R. D., 569
 Cova Garcia, F., 647
- David, A. & Krishnan, K. S., 541
 Davis, D. E. (580)
 De, S. N. & Chatterjee, D. N., 581
 DeLamater, J. N., Michaelson, J. B., Hall-
 man, Frances A. & Blumenthal, H., 584
 Deoras, P. J. & Ranade, D. R., 652
 Detinova, T. S., 527
 DeWitt, W. B., 610
 Donoso Infante, A., Amenábar, E., Del
 Solar, V. & Ramírez M., H., 587
 Dricot, C., 657
 Dumas, J., 662
- Edge, N. D., Hill, J. & Stone, Rachel,
 (546)
 Edington, G. M., 628
 Effat, S., 602
 d'Eshouqies, J. R. & Houel, J., (615)
 Evans, F., Schoenaers, F., Neujean, G.,
 Kaeckenbeek, A. & Styens, J., 543
 Everett, Martha G., Bhatt, P. N. & Fox,
 J. P., 561
 Eyquem, A. & Fine, J., 633
- Faggin, J. E., (552) bis
 Faiolo, A. & Caporaletti, I., 554
 Fairchild, G. B., 655
 Fernando, P. B., 627
 Figueiredo, N., 595
 Fine, J., Grouadde, J. & Eyquem, A., 632
 Fischer, J. T. & Traibel, J., 615
 Flöch, H., 600
 — & Sureau, P., 599
 Foote, R. H., 648
 Forsyth, D. M., 589
 Fox, J. P., Everett, Martha G., Robinson,
 T. A. & Conwell, D. P., 562
 de Freitas, J. L. P., Rocha, U. F., Vas-
 quez, J. A. Z. & Attimus, T. N., 549
 Friedheim, E. A. H., 544
 Friedman, Lorraine & Conant, N. F., 639
 Fulton, J. D. & Smith, A. U., 583
- Gallo, P., (573)
 Gaud, J., 648
 Germans, W., 616
 Ghanem, M. H., 617
 Gillett, J., (525), (579), (601)
 Gillett, J. D. & Ross, R. W., 566
 Goodwin-Bailey, K. F. & Davies, M., 654
 Gould, S. E., Gomberg, H. J. & Bethell,
 F. H., 625
 Gramiccia, G. & Saccà, G., 554
 Gridley, Mary F., 585
 Grignaschi, V. J., 540 bis
 Grönroos, P., 637
 Guedes, A. da S., de Freitas, J. R. &
 Xavier, S. H., 590
- Hallman, Frances A., Michaelson, J. B.,
 Blumenthal, H. & DeLamater, J. N., 584
 Halmagrand, J., 594
 Hawking, F., 538
 Heisch, R. B., 591
 Hellbrügge, T. & Dahme, E., 636
 Hiernaux, J., 630
 Himsworth, H. P., 656
 Hoffmann, R., (601)
 Hotta, S., 568
 Howles, J. K., Kennedy, C. B., Garvin,
 W. H., Brueck, J. W. & Buddingh, G. J.,
 638
 Hueston, J. T., 615
 Husain, M. M. S., 632
- Instituto de Nutrición de Centro América
 y Panamá, (627)
 Ito, T. & Saito, M., 591
 Iyengar, M. O. T., 619
- Jagues, E. & Schachter, M., (633) bis
 Jelínek, M., Setka, J. & Vošta, J., 589
 Jones, E. B., 626
 Jones, J. C., 529
 Jungalwalla, A., 616
- Kagan, I. G., 611
 Kartman, L., 620 bis
 Kawai, S., Okonogi, T. & Kijima, S., 578
 Knorr, R., 580
 Koprowski, H. & Black, J., 573, 574
 —, — & Nielsen, Doris J., 574
 Köttingen, H. U. & Kuschinsky, G., 624
 Kouri, P. & Basnayake, J. G., 586
 Krishnaswami, A. K., Satya Prakash &
 Ramakrishnan, S. P., 539
 Kuwata, T., Kuniyoshi, T. & Ito, H., 575

[Continued overleaf]

Alphabetical List of Authors or Sources—*cont. from page 3*

- Larsh, J. E., Jr., 626
Leprosy in India, 592
Lewis, S. M. & Lurie, A., 642
Lipparoni, E., 615
Littann, K. E., 594
- MacCarthy, Ethna, 623
McFadzean, A. J. S. & Choa, G. H., 577
Maegraith, B. & Harinasuta, C., 587
Masseguin, A. & Palinacci, A., 533
Maurin, J., 584
Mazzotti, L. & Treviño, A., 614
Merchant, S. M., 580
Meyer, K. F., Quan, S. F., McCrum, F. R. & Larson, A., 580
Micks, D. W. & Benedict, A. A., 648
Mitra, R. D., 553
Momose, T., 612
Mooser, H. & Weyer, F., 590
Morin, H. G. S., 584
Muirhead-Thomson, R. C., 528
Mukherjee, C. & Mukherjee, S. K., 628, 629
Myatt, A. V., Coatey, G. R., Hernandez, T. & Burton, H. W., 531
- Neal, R. A., 588
— & El Ámin El Karib, (549)
- Nikolitsch, M., 579
Noland, J. L., (655)
Norn, M. S., 623
- Oelkers, H. A. & Ohnesorge, G., 614
Oliver-Gonzalez, J., 617
Ovazza, M., 621
- Palmer, E. D. & Jahnke, E. J., Jr., 608
Pan, C., Williams, R. R. & Ritchie, L. S., 610
Praenense, W. L., 560
Pautrizel, R. & Nguyen-Vinh-Nien, 540
Pellegrino, J. & Brener, Z., 551
Peña Chavarria, A. & Guerrero Arguedas, J., 536
Péra, J. S., 551
Pérez Reyes, R., 550
Pessa, S. B. & Coutinho, J. O., 605
Pimentel, D. & Klock, J. W., 649
Plissier, M. & Secret, E., 597
- Quagliato, R., 595
- Raffaele, G. & Coluzzi, A., 533
Rageau, J. & Adam, J. P., 649
— — & Rivola, E., 527
Ramakrishnan, S. P., Satya Prakash & Krishnaswami, A. K., 539
El Ramly, Z., Sourou, A., El Sherif, A., Loutfy, M. & Ibrahim, M., 602
Ray, A. P. & Bhattacharjee, V. N., 542
Reagan, R. L., Stewart, Mildred T. & Brueckner, A. L., 566
— Strand, Nina Lee & Brueckner, A. L., 570
Rees, C. W., Baernstein, H. D., Beardon, Lucy V. & Phillips, Laura, 583
Regner, R., 640
Reid, J. A., 652
Réunion, 535 *bis*
Reynaud, J., 630
Rhodesia, Southern, Dept. of Health, 626
Riaz-Ul-Hassan, S., 542
Richard, C., 655
Risi, J. B., Fonte, J. & Rossas, T. P., 596
Roberts, A., 663
Roche, J., Derrien, Y., Diacono, G. & Roques, Marie, 631
- Rodriguez M., J. D., 551
Rogers, L., 580, 600
Rollier, R. & Pelbois, F., 597
Rose, J. R., 634
Roy, A. T., 598
Rozeboom, L. E., 529
Ruiz Rodriguez, J. M., 607
- Sadun, E. H. & Maiphoom, C., 612
Sanborn, C. C., (570)
Schädlingsbekämpf., 655
Schoop, G., 568
Schöttler, W. H. A., 633
Schwetz, J., 601, 604
Secret, E., 598
El Sherif, A., 608
Sherwood Jones, E., Maegraith, B. G. & Gibson, Q. H., 587
Shimizu, Y., 596
Shirakawa, T., 611
Shute, P. G. & Maryon, M., 532
Silva, M. A. da A., 547
Singer, K. & Singer, Lily, 630
Singh, M. M., Kapoor, S. P. & Singh, G., 628
Soberón y Parra, G. & Cervantes, D., 531
Soekawa, M. & Kashikura, N., 572
Sourander, P., 570
South Pacific Commission, 619
Souza Campos, N., (598)
van Steenis, P. B., 589
Stevenson-Hamilton, J., 663
- Tahori, A. S. & Hoskins, W. M., 653
Takano, K. & Kitaoka, M., 565
Tange, Y., (633)
Thalhammer, O., 635
Thomas, Ruth E., 599 *ter*
Toledo, S. da A. & de Azevedo, P. A., (640)
Treviño V. A., Amanda Reyes, Lydia & Mendoza M., F., 530
- Urquhart, G. M., (613)
- Vaisman, A. & Hamelin, A., 590
Valentine, J. C., Lane, W. F., Beattie, C. P. & Beverley, J. K. A., 634
Vedamuthu, I., 598
Veeraraghavan, N., 660 *bis*
Vincke, I., Peeters, E. & Frankie, G., (536)
- Wagner, W. H., Pedal, H. W. & Schönenberger, A., 547
Wakeley, C., 661
Warren, L. & Manwell, R. D., 541
Wattley, G. H., 590
Weinstein, P. P., Krawczyk, H. J. & Peers, J. H., 613
Welch, Sarah F. & Schoof, H. F., 651
Weng, Hsin-chih, Chung, Huelan, Hou, Tsung-ch'ang & Ho, Lien-yin, 558
Westphal, A., 647
Whitfeld, P. E., 537
Wigand, R., Peters, D. & Urteaga B., O., 565
Wilks, N. E. & Sonnenberg, B., 646
Winckel, W. E. F., Fros, J. & Wijngaarde, E., 620
Wolfssohn, M., 651
Wood, S. F., 550, 552
World Health Organization, 626
- Yaoi, H., Takei, M., Maeda, H. & Yaoi, H., Jr., (579)
Yates, W. W., 649
- Zhovtuli, I. F., 650